Aus dem Mannheimer Institut für Public Health (MIPH)
der Medizinischen Fakultät Mannheim
(Direktor: Prof. Dr. med. Joachim E. Fischer)

Transformational leadership and depressive symptoms: Validation of a short transformational leadership scale

Inauguraldissertation
zur Erlangung des medizinischen Doktorgrades
der
Medizinischen Fakultät Mannheim
der Ruprecht-Karls-Universität
zu
Heidelberg

vorgelegt von
Max Leonhard Seegel

aus
Kassel

2019

Dekan: Prof. Dr. med. Sergij Goerdt

Referent: Prof. Dr. med. Joachim E. Fischer

INDEX

LIST OF ABBREVIATIONS

4 I's	individualised consideration, intellectual stimulation, inspirational motivation and idealised influence (subscales of TL)
AV	identifying and articulating a vision (subscale of the TLI)
BDI	beck depression inventory
BMI	body mass index
CAS	clinical anxiety scale
CFA	confirmatory factor analysis
CFA	comparative fit index
COR	conservation of resources (theory)
CR	contingent reward
DALY	disability adjusted life years
DSM-V	diagnostic and statistical manual of mental disorders fifth edition
FAG	fostering the acceptance of group goals (subscale of the TLI)
FRL	full range of leadership (theory)
GBD	global burden of disease study
GDD	gross domestic product
GTL	global transformational leadership scale
HADS	hospital anxiety and depression scale
HADS-D	hospital anxiety and depression scale – depression subscale
HPE	high-performance expectations (subscale of the TLI)
ICD-10	international classification of diseases (tenth version)
IS	providing individualised support (subscale of the TLI)
ISN	intellectual stimulation (subscale of the TLI)
JD-R	job demand-resource (theory)

LF	laissez-faire leadership
MBE-A	active management by exception
MBE-P	passive management by exception
MDD	major depressive disorder
MLQ-5x	multifactor leadership questionnaire (short version)
OECD	organisation for economic co-operation and development
OR	odds ratio
PAM	providing an appropriate model (subscale of the TLI)
RMSEA	root mean square error of approximation
SCL-90	symptom checklist-90
SEM	structure equation modelling
SOC	sense of coherence (theory)
STAI	state-trait anxiety inventory
TL	transformational leadership
TLI	transformational leadership inventory
TLIx	tucker-lewis-Index
WHO	world health organisation
YLD	years of life lived with disability
YLL	years of life lost due to premature mortality
X^2	chi-Square

1 INTRODUCTION

Depressive disorders are common in the general population (Jacobi *et al.*, 2004) with increased prevalence for women and people of working age (Stewart, 2003). Depressive symptoms like loss of energy and diminished concentration impair work performance (Lerner and Henke, 2008) and the associated direct (e.g., medical treatment, transport and social services) and indirect (e.g., absenteeism, presenteeism and premature death) costs represent a high burden for the affected individuals, their families, employers and social security systems alike (Simon *et al.*, 2001; Luppa *et al.*, 2007).

The aetiology of depressive disorders is not yet fully understood, but various risk factors have been identified including sex, character traits, adverse life events and workplace factors (Bruce and Hoff, 1994; Beardslee and Gladstone, 2001; Kendler, Gardner and Prescott, 2002; Riolo *et al.*, 2005; Netterstrøm *et al.*, 2008). As most people spend a significant part of their day at work, it is important to understand workplace factors that either prevent or promote the development of depressive symptoms in employees.

Research in occupational health revealed that among aspects like high job demands, low social support (Netterstrøm *et al.*, 2008) and job strain in general (Mausner-Dorsch and Eaton, 2000) also direct influence by superiors is an important modifiable risk factor for the development of depressive symptoms (Finne, Christensen and Knardahl, 2014). Especially high levels of Transformational Leadership (TL), one of the most examined leadership styles (Judge and Piccolo, 2004), have been associated with reduced depressive symptoms (Munir, Nielsen and Gomes Carneiro, 2010; Perko, Kinnunen and Feldt, 2014).

The present study examines the association of Transformational Leadership behaviour, and its specific subcomponents, with depressive symptoms in employees.

The next section provides a general background and introduces the concept of leadership and depression. However, prior to reviewing the process leading researchers from focusing on physical workplace hazards towards factors like job stress and mental health, the current state of occupational health and leadership research in industrialised countries will be outlined.

1.1 Background

As working conditions in industrialised countries changed significantly over the past decades, also did the factors that influence a worker's health. The following section first outlines how the change in workplace hazards took place and second the WHO's policy in reaction to those changes, which finally lead to the concept of public and occupational health which we know today.

1.1.1 What made and makes workers sick?

The factors that influence a worker's health have changed: During the industrial revolution, physical and chemical workplace hazards were the most important factors to cause death and disability among the working population and were therefore of utmost importance for public and occupational health. Working environments and safety regulations subsequently improved in industrialised countries. In today's, so-called "post-industrialised stage" the WHO (1994) sees a diminishing risk of the traditional physical, biological, mechanical and chemical hazards in those countries.

In the 1970s the majority (60-70%) of employees in the OECD countries were employed in blue-collar jobs (manual labor). Until the 1990s the employment rate shifted to 60-70% in white-collar jobs (work in office environments). This shift is mainly due to two developments: The 1960s and 1970s introduced new technologies in the workplace, above all electronic data processing. In the 1980s companies faced the

effects of globalisation and the pressure of increasing competition (Sparks, Faragher and Cooper, 2001).

New job demands (e.g. increased flexibility, higher education needed, increased work pace and a growing amount of short-term contracts) increased mental work stress and related diseases like depressive disorders (WHO, 1994; Sparks, Faragher and Cooper, 2001; Roelen *et al.*, 2008). The new work characteristics also lead to changing requirements in leadership behaviour to promote companies' responsiveness. In reaction, the WHO declared psychosocial work stress as one of the most important, yet neglected, challenges of the 21st century, representing an important modification in the previous policy which is outlined below. To prevent work-related stress the WHO proposed actions based on changes in the organization of work and the organizational culture. Part of this is the improvement of managerial quality which affects both aspects (Houtman, Jettinghoff and Cedillo, 2007).

1.1.2 A long way to new public and occupational health policies

The term public health originally referred to the prevention and treatment of population-wide scourges such as infectious diseases, hunger and infant mortality. Winslow (1920) described it almost 100 years ago as "The science and art of preventing disease, prolonging life and promoting health through the organised efforts and informed choices of society, organisations, public and private, communities and individuals". Individualised medicine has long controlled this field; however, along with medical and demographic change, the focus shifted (Rosenbrock, 2001).

As early as 1986, the WHO introduced a new strategy to promote public and occupational health, the Ottawa Charta, with the aim to reach "health for all" by the 21st century (WHO, 1986). Health promotion defines the process of enabling people to

increase control over, and to improve, their health. The WHO introduced three main strategies to achieve this aim: "advocating" "enabling" and "mediating".

Advocacy means creating the same premises for health for everyone by making political, economic, social, cultural, environmental and biological factors favourable for health promotion. Enabling means that all people can take control of the things that determine their health themselves, thus achieving equal opportunities for health in everyone. Finally, all the players who can influence health (health sector, government, economy) mediate these processes, thus all need to contribute to health promotion to ensure the pursuit of health (WHO, 1986). In summary, the Ottawa Charta aims at the empowerment of the individual, the collaboration of government and independent organisations and the concentration on "Making the healthier way, the easier choice" (WHO, 1986; Schott and Kuntz, 2011).

This “new public health” goes beyond the focus of disease prevention as a typical field of individualised medicine and is instead more concerned with structural and situational prevention. In this sense, health promotion could help reduce the so called medicalisation, which results from the predominance of clinical (curative) medicine, that is alongside with economisation one of the main obstacles for the new public health (Rosenbrock, 2001).

Public and occupational health are intertwined. According to the WHO, “The ultimate objective of occupational health is a healthy, safe and satisfactory work environment and a healthy, active and productive worker, free from both occupational and non-occupational diseases and capable and motivated to carry out his or her daily job by experiencing job satisfaction and developing both as a worker and as an individual.” (WHO, 1994). The cornerstone of occupational health is its preventive nature.

As companies naturally follow financial interests, occupational health actions have to be cost-effective as otherwise they rarely would be applied. The WHO states that a

high standard of occupational health and safety correlates positively with a high gross domestic product (GDP) per capita due to improved productivity, improved quality of products, improved satisfaction and work motivation (WHO, 2006).

1.2 Leadership

As aforementioned, leadership is important to guide companies through periods of change and to protect profit margins. But why should leaders invest in the promotion of employee well-being? The WHO (2010) proposes three reasons: First, it should be a moral imperative of any company to protect, rather than to harm employees. Second, laws for workplace safety regulations provide a legal background for fines and punishments against leaders and whole companies. Third, and most important, the WHO states that: "… the most successful and competitive companies are those that have the best health and safety records and the most physically and mentally healthy and satisfied workers."

The following section first outlines how leadership can influence a worker's health and, second, describes different types of leadership behaviour, their characteristics and why transformational leadership is likely to play an important role in the prevention of burnout and depression.

1.2.1 Leadership, personal resources and workers' health

The prime responsibility for health and safety in a workplace rests with the management as leaders either approve or decline health promotion actions. However, any interaction of leaders with their followers, even without any specific intent, can result in reactions in the employee that either foster or impair their physical and psychological well-being (Judge and Piccolo, 2004; Kuoppala *et al.*, 2008; Nielsen *et al.*, 2009). For example: "A leader tells the employee that he/she will receive an assignment, the completion of which will be of great importance for the future of the company." On the one hand, the employee could either be satisfied that he/she is trusted with meaningful work. On the other hand, the followers' stress level could rise as he/she expects to fail or perform badly in the face of challenge.

Leaders, therefore, play an essential role in the success of health promotion strategies at the workplace. Wegge et al. (2014) describe five theoretical pathways (see Table 1) that connect leadership behaviour and employee health. These pathways are described in detail below.

Table 1: Theoretical pathways of the influence of leadership behaviour on employee health (Modified from Wegge et al. (2014))

Pathway	**Nature of health-promoting behaviour**
1. Person-focused action	Promoting or hampering individual employees' health directly
2. System-focused action	Initiating actions and policies that benefit or harm the workforce
3. Moderating action to mitigate the impact of contextual factors	Buffering workers from the impact of environmental stressors or protecting and promoting their resources
4. Climate control and identity management	Cultivating health-related shared perceptions and actions within teams; crafting a shared identity
5. Modelling	Exemplifying particular health behaviour; being affected by the health behaviour of followers

1.2.1.1 Person-focused action

Leaders can exert direct effects on their follower's health with their behaviour. If an employee experiences stress, the leader can either try to reduce it by supporting the follower with material- (e.g. reducing workload), cognitive- (e.g. providing individual task support) or emotional (e.g. inducing optimism) means. On the other hand, the leader can decide not to support the follower or even to engage in destructive measures such as harassment or humiliation. Leaders trying to increase work performance of employees, often use pressure (e.g. proposing to work harder or over-hours to finish a task) instead of providing workers with options such as increased individual freedom within task completion.

1.2.1.2 System-focused action

Leaders can influence contextual parameters of the workplace that are associated with reduced or increased distress in followers. Those actions are not directed to the individual employee but rather to the level of the whole team or organisation. If a leader encourages employees to respect breaks and office hours, workers are less likely to feel obliged to work overtime. The contrary would be a work policy in which employees are encouraged to feel guilty for leaving their job on time which could lead to overcommitment and exhaustion in employees.

1.2.1.3 Moderating action to mitigate the impact of contextual factors

Leaders can influence pre-existing personal or organisational resources that can in turn influence the appraisal of a potential stressor. For example, new management, financial cutbacks or possible layoffs pose a threat for each company. Leaders could either display a fatalistic attitude (“we are all doomed”) or try to guide followers through times of hardship, providing certainty and stability. It is evident that the leader's

statements genuinely have to be in favour of the employee; otherwise, the leader's hypocritical actions lead to loss of confidence in the leader and the company (Bass, 1999).

1.2.1.4 Climate control and identity management

Leaders can foster shared perceptions and actions in a team, reducing intra- and interpersonal conflicts. Shared perception of health behaviours or shared group identity, in general, can influence followers' health (Zwingmann *et al.*, 2014). A leader who sets the example of taking the bike to work or who doesn't ask employees to answer work-related emails on weekends can set a healthy example for the whole workforce.

1.2.1.5 Modelling

This pathway is described as a bi-directional feedback loop. Leaders, on the one hand, serve as role models of health behaviour for their employees. On the other hand, leaders also respond to the employee's health. Not only leaders represent a resource for their followers, but vice-versa the health of followers is an essential resource for leaders (Wegge, Shemla and Haslam, 2014).

1.2.2 Different leader behaviours - The full range of leadership theory

The previous section discussed the effects leadership behaviour, in general, has on employee health. As different companies promote different styles of leadership, which in turn influence employees health differently, the following chapter gives an outline of the full range of leadership theory (FRL) by Bass and Avolio (1991). This concept describes leadership as a passive-active continuum on which laissez-faire (LF), transactional and transformational (TL) leadership are placed (Figure 1; (Kirkbride,

2006)). Of those three concepts, TL has been shown to have the most evident association with employee mental health (Skakon *et al.*, 2010).

1.2.2.1 Laissez-faire leadership (LF)

Absence or avoidance characterise a laissez-faire leader. He or she avoids making decisions, is hesitant when taking action is required and absent when needed (Judge and Piccolo, 2004). Because of the complete lack of intervention, LF is also considered a non-leadership behaviour (Bass, 1985; Judge and Piccolo, 2004).

1.2.2.2 Transactional leadership

Transactional leadership is based on the concept of positive reinforcement of successful behaviour in three dimensions: Passive management by exception (MBE-P), active management by exception (MBE-A) and contingent reward (CR) (Burns, 1978; Bass, 1999).

Management by exception characterises the degree to which the leader takes corrective action based on the employee's work (Howell and Avolio, 1993). Passive management by exception (MBE-P) symbolises a leader who waits until problems have arisen to take corrective action. In this sense, a leader tends to exert LF under normal circumstances but intervenes when deviations from standard procedure or mistakes occur.

Active management by exception (MBE-A) means that the leader acts before problems arise from the employee's work. The leader stays alert to mistakes and deviations in order to intervene early.

A specific reward for a clarified effort such as praise for work done, recommendations for pay increases, bonuses and promotions but also public recognition and honours for outstanding service is called contingent reward (CR) (Bass, 1985). The leader expects

an effort that is sufficient to finish the task ahead. Provided that both leader and follower know what to expect from one another, leader-follower interaction becomes more predictable (Nerdinger, 2008).

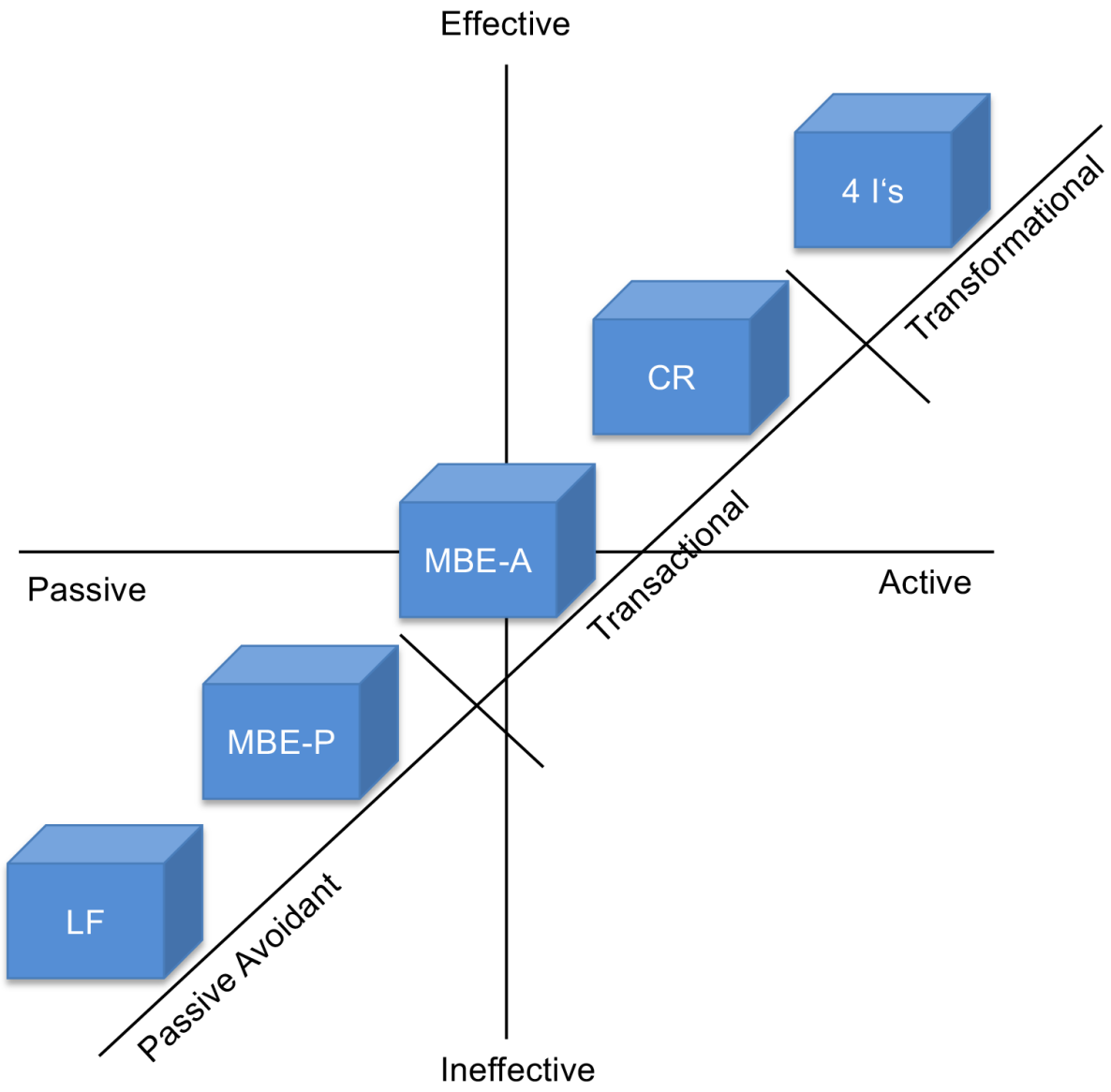

Figure 1: Properties of different leadership styles in the full range of leadership theory (Modified from Bass & Riggio (2006))
LF: laissez-faire leadership; MBE-P: passive management by exception; MBE-A: active management by exception; CR: contingent reward; 4 I's: individualised consideration, intellectual stimulation, inspirational motivation and Idealised influence

1.2.2.3 Transformational leadership (TL)

In industrial training, TL is the concept needed to get employees to "walk that extra mile" (Kirkbride, 2006). It is currently the most researched model in leadership theory (Judge and Piccolo, 2004), first introduced by Burns (1978) who opposed transformational and transactional leadership in political leaders. The concept of TL originates in the face of new ways of production, globalisation and change in organisational culture. As jobs have moved from the primary sector (production) to the tertiary sector (service), companies are forced to respond even quicker to their customer's needs. Management-styles that promote autonomy, personal empowerment and team effectiveness instead of only relying on CR offer advantages in flexibility and responsiveness (Montoya-weiss, Massey and Song, 2001; Özaralli, 2003; Dionne *et al.*, 2004; Nerdinger, 2008).

On this basis, Bass (1985) built his theory of TL. He saw the difference between TL and transactional leadership in what leaders and followers offer one another (Conger and Kanungo, 1998). Figure 2 depicts how TL adds to the effects of transactional leadership, leading to increased effort and work-performance. Where in transactional leadership the exchange of effort for a well-defined reward is central, the transformational leader exceeds this plain exchange and inspires his/her follower's intrinsic motivation thus exceeding short-term goals and going beyond the follower's self-interest. TL is thought to foster followers' commitment to quality and productivity (Masi and Cooke, 2000; Gang Wang *et al.*, 2011) and has been shown to be effective on objective criteria such as sales figures (Felfe, 2006; Ling *et al.*, 2008). Furthermore, Bass states that the leader is able to raise the employee's level on Maslow's hierarchy from deficiency needs to growth needs such as self-actualisation (Bass, 1985; Howell and Avolio, 1993; Judge and Piccolo, 2004). In a society in which the importance of

job security and loyalty become less important compared to autonomy and flexibility, Bass (1999) argues that TL can improve followers' job satisfaction.

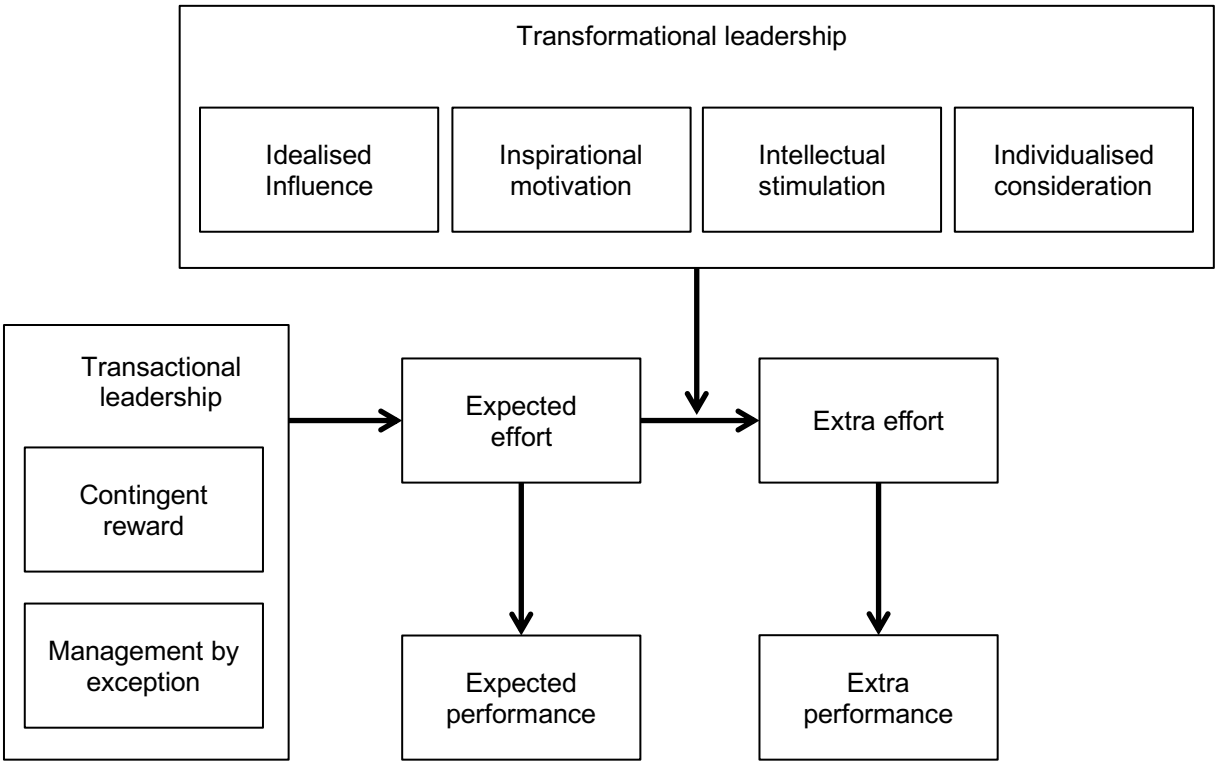

Figure 2: The motivational effects of TL as opposed to transactional leadership. Modified from Nerdinger (2014).

Since its definition, the theory of TL has undergone several revisions. Table 2 shows the dimension of TL in its first version, which consists of four dimensions: individualised consideration, intellectual stimulation, inspirational motivation and idealised influence (Charisma) (Burns, 1978; Bass, 1999).

Table 2: Dimensions of TL according to Bass (1985, 1999).

Individualised consideration	The leader attends to each follower's needs, acts as a mentor or coach to the follower, and listens to the follower's concerns and needs. The followers receive individual tasks, and responsibilities for their actions and the transformational leader avoids treating every subordinate identically.
Intellectual stimulation	The leader encourages his followers to challenge given beliefs, take risks and supports followers' ideas. This trait stimulates and encourages creativity in the followers and aims at enhanced problem-solving capabilities and seeking new ways of doing things.
Inspirational motivation	An inspiring leader who articulates a bright and attractive vision that appeals to his followers. This leader communicates optimism about future goal attainment and meaningful work.
Idealised influence / charisma	The leader acts as a role model for his/her followers and appeals to them on an emotional level, promoting desirable behaviour. Charismatic leaders are self-confident, show no inner conflicts, are determined and provide the ability and knowledge needed to perform the task at hand.

As the charismatic leader has a significant influence on his/her followers, Bass (1999) emphasises the importance of moral factors, honesty and integrity to distinguish TL from pseudo-TL.

In response to methodological concerns, the TL scale was modified. Measurement of TL with the most established questionnaire, the Multifactor leadership questionnaire (MLQ-5x) by Bass and colleagues (Bass 1985, Bass Avolio 2000), revealed concern about the model's factor structure. The MLQ-5x comprises the full range of leadership model with the following aspects: idealised influence attributed, idealised influence behaviour, inspirational motivation, intellectual stimulation, individualised consideration, CR, MBE-P, MBE-A and LF. The major flaws of the model are high intercorrelations in-between transformational and between transformational and transactional scales (Heinitz and Rowold, 2007).

In response to this criticism, Podsakoff et al. (1990) performed literature research and large-scale confirmatory factor analysis to identify the central transformational behavioural traits. The authors further specified the charismatic/inspirational characteristics of TL and summarised TL behaviours in the following six scales shown in Table 3.

Table 3: Comparison of the original dimensions of TL and the actualisation by Podsakoff et al. (1990).

Scales by Bass	**Scales by Podsakoff**	**Description**
Individualised consideration	Providing individualised support (IS)	Leaders are concerned about their followers and care about their personal feelings and needs.
Intellectual stimulation	Intellectual stimulation (ISN)	Leaders encourage their followers to re-examine some of their assumptions about their work and to rethink how it can be performed.
Inspirational motivation	High-performance expectations (HPE)	Behaviour that shows leaders have high expectations for quality and performance on the part of the followers (Podsakoff *et al.*, 1990; Bass, 1999).
Idealised influence / charisma	Identifying and articulating a vision (AV)	Leaders aim to identify new opportunities for their company and inspire others with their vision of the future.
	Providing an appropriate model (PAM)	Leaders set an example for their employees to follow which is consistent with their values.
Not defined	Fostering the acceptance of group goals (FAG)	Leaders unite their followers to work together for a common goal by encouraging cooperation among employees.

Three of the six dimensions, AV, FAG and PAM show higher intercorrelations which lead Podsakoff (1990) to suggest that they could represent an underlying core transformational leadership behaviour (core TL). Also, those are the aspects authors most agreed upon in different models of TL in the past decades (Podsakoff *et al.*, 1990; Heinitz and Rowold, 2007).

1.2.2.4 Health effects of TL

Bass and colleagues (1989) quickly recognized the possibility that the increased productivity coming alongside with TL may also lead to human costs such as stress or burnout. In answer to that question, they found that TL overall was related to reduced risk of reporting burnout (Seltzer, Numerof and Bass, 1989). Since then there has been a considerable amount of studies on the relation of TL and measures for health. Most studies in research on TL and health focus on increased employee well-being as the outcome (Arnold *et al.*, 2007; Arnold, 2017). Well-being is a broad measure including various symptoms that are not related to work performance. Depression, on the other hand, comprises symptoms like loss of energy, interest, psychomotor retardation and diminished ability to concentrate which directly impede work-performance. Thus there is extensive research on depression in the workforce context (Rost, Smith and Dickinson, 2004; Lerner and Henke, 2008).

1.2.2.5 Limitations of TL

The concept of TL originates in the USA (Burns, 1978) and much of the initial research on TL was carried out on white members of the American military (Corrigan *et al.*, 2003). Nerdinger (2008) states that TL could be a phenomenon of the “American dream” mentality. Recent evidence suggests that those employees with character-traits similar to the leader (extraversion, self-confidence, independence, high-

performance) are most likely to benefit from TL behaviours (Felfe, 2006). Interestingly though, the relation of TL and employee health has been higher in countries with high power-distance between leader and employee (as e.g. China or Russia), where transformational actions could be stronger valued (Zwingmann *et al.*, 2014).

Apart from that, a transformational leader has to meet high ethical and moral standards to fulfil his symbolic purpose as an inspirational leader. The result of a lack of those ethical standards can be a misuse of power and a so-called “pseudo-TL " in which the leader's charisma feeds his own purposes (House and Howell, 1992; Bass, 1999). In companies where organisational contexts require low sickness absence rates among employees, TL could promote presenteeism. The same concept could apply to over hours worked due to TL (Seltzer, Numerof and Bass, 1989).

1.3 Depression

The following section discusses depressive disorders, which are, according to the burden of disease study (GBD), one of the most important sources of disability-adjusted life years (DALY) in industrialised countries. This section gives an overview of the role depressive symptoms play at the workplace, their incidence and individual and economic impact. Also, the clinical classification systems and general risk factors for the development of depressive disorders are outlined. Finally, the importance of leadership as work-related risk factor is examined.

1.3.1 Introduction

Depressive symptoms impair work performance (Lerner and Henke, 2008) and those affected by depressive symptoms have higher rates of sick leave and are prone towards job-loss and downward socioeconomic mobility (Rost, Smith and Dickinson, 2004; Lerner and Henke, 2008). The associated direct (medical treatment, transport and social services) and indirect (absenteeism, presenteeism and premature death) costs represent a high burden for both companies and the social systems (Simon *et al.*, 2001; Luppa *et al.*, 2007).

Moreover, depressed workers are often not clearly recognizable. The disease is multifaceted, and the change from mild to severe depressive symptoms is gradual (Prisciandaro and Roberts, 2005). Thus, the absence of a clinical diagnosis does not mean the absence of depressive symptoms in an employee (Perko, Kinnunen and Feldt, 2014). Symptoms can start with slow changes at work like trouble concentrating, remembering or making decisions. Further somatic symptoms like sleeping problems with increased fatigue or changes in weight can develop. Impaired performance and the feeling of being permanently slowed down can lead to further withdrawal from co-workers and loss of interest in work (WHO, 2010).

The period in which an affected person is still present at the workplace but physically or mentally impaired and therefore works with reduced effectiveness is called presenteeism. The impairment in the performance of mental-interpersonal tasks and time management, both crucial aspects in the post-industrialised age, exceeds that of traditional physical job-tasks. Also, there is a dose-response relationship between depressive symptoms and work-impairment (Lerner and Henke, 2008). Because of those effects, the high prevalence and the high number of undiagnosed cases, the cost of presenteeism is believed to exceed that of absenteeism by 4-5 times (Stewart, 2003; Lerner and Henke, 2008; WHO, 2010).

1.3.2 Epidemiology and impact

Major depressive disorders (MDD) are highly prevalent. The 12-month prevalence in developed countries, according to DSM-criteria, has been found to be approximately 5.5%. The prevalence varies across age groups with highest values in the youngest age group (18-34: 7%; 35-49: 6%; 50-64: 5.1%; 65+: 2.6%); (Kessler *et al.*, 2010). Lifetime prevalence has been found to be as high as 17.1% with increased risk for females (23.3%) in comparison to males (11.1 %) (Jacobi *et al.*, 2004).

The GBD study of 2010 identified that of 2.5 DALYs 3.0% were caused by MDD, representing the 11th place of DALYs caused worldwide. One DALY stands for the loss of a healthy year of life and combines the "years of life lived with disability" (YLD) and the "years of life lost due to premature mortality" (YLL).

MDD was the second leading cause (8.2%) of YLD after lower back pain. The most significant proportion of YLD was represented by those in working age (15 to 64 years: 60.4 million YLDs), peaking in the 20s and overall higher for females (Ferrari *et al.*, 2013).

1.3.3 Depressive disorders: Clinical classification systems

The two major classification systems that are used to categorise depression are the International Classification of Diseases in its 10th revision (ICD-10); (WHO, 1992) and the Diagnostic and Statistical Manual of Mental Disorders in its fifth edition (DSM-V); (APA, 2013). Both define thresholds for severity, duration and course of disorder and overlap in most parts (see Table 4). In the ICD-10 two of three major symptoms (depressed mood, loss of interest in everyday activities, reduction in energy) plus two of seven associated symptoms are required to diagnose a depressive episode. In the DSM-V five of nine symptoms have to be present, including at least one of the first two (depressed mood, loss of interest). The duration required is two weeks with symptoms significantly impairing social, occupational or other areas of life for at least half of the two weeks. Depending upon the number and severity of the symptoms, a depressive episode specifies as mild, moderate or severe (British-Psychological-Society, 2010). Both classification systems share that major criteria must be present for diagnosis. But even subclinical depressive symptoms result in work impairment (Lerner and Henke, 2008; Briley and Lépine, 2011). Reduced concentration capacity leads to loss of productivity (De Graaf *et al.*, 2012). Depressed workers have difficulties performing mental-interpersonal tasks and social functions (Adler *et al.*, 2006; Briley and Lépine, 2011) which can lead to reduced self-esteem and psychomotor retardation.

In summary, not only MDD as defined by ICD-10 or DSM-IV but the full spectrum of depressive symptoms is of importance in the workforce context.

Table 4: Comparison of the two clinical classification systems of depression, ICD-10 and DSM-V, modified from the British Psychological Society & the royal college of psychiatrists (2010).

ICD-10	**DSM-V**
Depressed mood	Depressed mood (as reported by subjective account or observation)
Loss of interest	Loss of interest or pleasure (as reported by subjective account or observation)
Reduction in energy	Fatigue/loss of energy
Loss of confidence or self-esteem	Feelings of worthlessness or excessive/inappropriate guilt
Unreasonable feelings of self-reproach or inappropriate guilt	
Recurrent thoughts of death or suicide	Recurrent thoughts of death, suicidal thoughts or suicide attempts
Diminished ability to think/ concentrate or indecisiveness	Diminished ability to think or concentrate, or indecisiveness
Change in psychomotor activity with agitation or retardation	Psychomotor agitation or retardation
Sleep disturbance	Insomnia/hypersomnia
Change in appetite with weight change	Weight loss (more than 5% of body weight in a month) or weight gain, or decrease or increase in appetite

1.3.4 Pathophysiology and risk factors

The causal pathway of the development of depressive symptoms remains unclear. Most likely it is multifactorial and includes both genetic and psychosocial factors (Kuehner, 2003). Considerable evidence from twin and family studies suggests that MDD is a familial disorder, suggesting the influence of genetic factors in the monoaminergic neurotransmission and the hypothalamic-pituitary axis (Levinson, 2006). Those factors supposedly contribute to disease susceptibility (Flint and Kendler, 2014).

Personal traits like high values of neuroticism or negative emotionality have been identified to be general risk factors for psychiatric disorders and low values for extraversion especially for chronic forms of MDD (Kotov *et al.*, 2010). Personal and environmental risk factors for the development of depression include adverse life events (physical disease or loss of loved ones), childhood abuse, substance misuse (Beardslee and Gladstone, 2001; Kendler, Gardner and Prescott, 2002; Netterstrøm *et al.*, 2008), unmarried status, female sex, employment status, poverty, physical illness and lack of education (Bruce and Hoff, 1994; Riolo *et al.*, 2005; Netterstrøm *et al.*, 2008). Stress, in general, is a factor that can increase the incidence and duration of depressive symptoms (Cohen, Janicki-Deverts and Miller, 2007). As most people spend a significant part of their day at work, workplace factors, are an important potential source of either satisfaction or stress in life. Research linked specific stressful work-events but also negative structural work-related factors to depression (Nerdinger, 2008).

1.3.5 TL and depressive symptoms

Two studies report on the specific association of TL and depressive symptoms. (Munir, Nielsen and Gomes Carneiro, 2010; Perko, Kinnunen and Feldt, 2014). Munir et al. (2010) evaluated prospectively the connection between TL and depressive symptoms in healthcare workers. They showed that TL, measured with the unidimensional Global Transformational Leadership Scale (GTL), was negatively associated with depressive symptoms at baseline and follow-up. In the study by Perko et al. (2014), which used a cross-sectional design, the relation of TL and depressive symptoms was mediated by personal resources such as reduced work-related rumination, higher occupational self-efficacy and higher perceived meaningfulness of work. This study again used the GTL to assess TL. Interestingly, in both studies, women were highly overrepresented.

From a theoretical perspective, and supported by the study of Perko et al. (2014), research on the influence of TL on psychosocial well-being proposes that especially TL provides employees with an opportunity to protect and even gain personal resources (Walsh, Dupré and Arnold, 2014) which, in turn, buffer the effect of work stressors on individual psychological health as described in the Job-Demands-Resources (JD-R) theory by Bakker & Demerouti (2007). The JD-R theory groups occupational risk factors for job stress in two categories, namely job demands and job resources, each consisting of physical, psychological, organisational and social aspects (Figure 3) (Bakker and Demerouti, 2007).

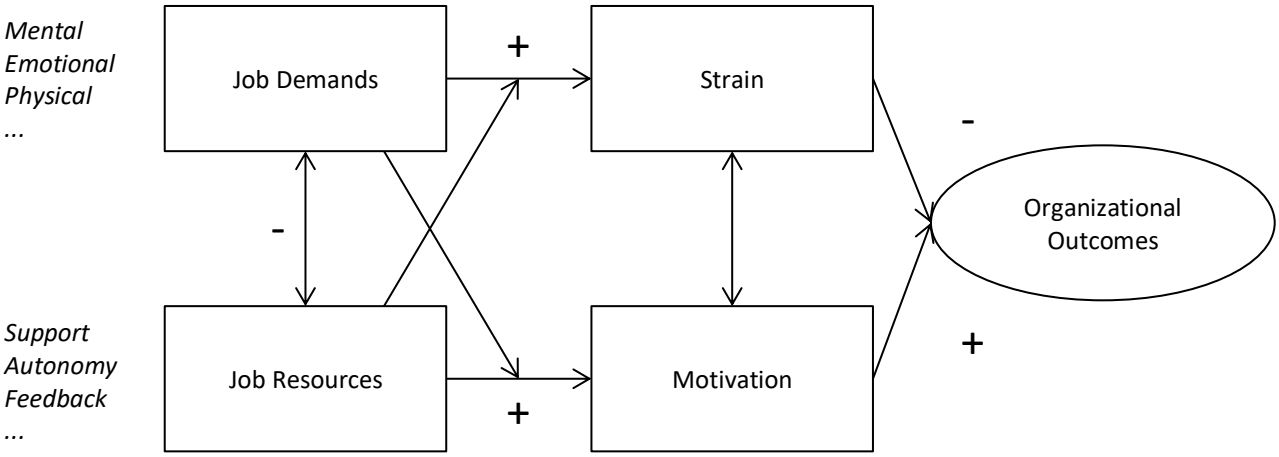

Figure 3: The proposed mechanisms of the Job-Demand-Resource (JD-R) model; Modified from Bakker & Demerouti (2007).

Job demands are represented by those aspects that require the employee to invest skills or effort and thus lead to physiological and psychological costs. Job resources, on the other hand, are those aspects that help achieve work goals, can reduce job demands and the related costs or stimulate personal learning, growth and development.

In the JD-R model, the development of health outcomes is a dual process. At first, the various demands exhaust the employee's resources which in turn leads to loss of energy and in the end health impairment. Employees will still try to uphold performance, by an increased individual effort which leads to sympathetic activation. Those strategies diminish the immediate effect on task performance but cause long-term loss of energy and fatigue. The higher the activation, the higher the resulting costs (Bakker and Demerouti, 2007; Peters and McEwen, 2012). On the other hand, resources also contain motivational aspects themselves. Employees with high job resources tend to be less cynical and show higher work performance. Resources help

the employee develop and represent preconditions to fulfil work-tasks (Bakker and Demerouti, 2007).

Job demands and job resources interact with each other as resources can buffer the effect of demands on health outcomes. The Conservation Of Resources model (COR) by Hobfoll (1989) describes that, especially when demands are high, the role of resources becomes more critical (Bakker and Demerouti, 2007). According to this model, people strive to protect and strengthen their resources (e.g. material, energetic, and personal). Individuals with a vast pool of resources can invest those to prevent further loss of resources. Those who are more successful in managing stressors can even risk resources to gain new resources ("gain spiral"). People with few resources are more susceptible to resource loss and in consequence are less capable of handling stressors (Hobfoll, 1989).

Perko et al. (2014) showed that TL is associated with increased personal resources like perceived meaningfulness of work and occupational self-efficacy. Stretching further, the motivational nature of TL (AV, IS) could also induce positive appraisal of upcoming tasks which would serve as another resource toward diminishing the perceived demands. Another central aspect of TL is the promotion of working towards common goals (FAG), an attribute which can strengthen organizational support culture (Lyons and Schneider, 2009), which is another important protective resource for employees (Nielsen and Daniels, 2012).

Intellectual stimulation (IS) could either be a resource as employees are encouraged to think apart and experience more freedom (resource) in how they conceptualise their work. On the other hand, it could also promote insecurity and stress.

In summary, it seems plausible that different aspects of TL behaviour each could exert contrary effects on job demands, job resources and their interaction. Therefore, the present study uses a more complex tool to measure TL.

1.4 Research question and aims of the study

TL is inversely associated with depressive symptoms (Munir, Nielsen and Gomes Carneiro, 2010) which is supposedly attributable to TL strengthening personal resources according to the JD-R theory (Perko, Kinnunen and Feldt, 2014; Schmidt *et al.*, 2014). However, as the two studies examining this connection only used a unidimensional tool to measure TL (GTL) it remains to investigate the relevance of the TL dimensions (IS, ISN, HPE, AV, FAG, PAM), and if especially those who have previously been labelled as core TL (AV, FAG and PAM) are essential in this association. Identifying the most relevant dimensions, also with respect to depressive symptoms, could inform about most adverse leadership behaviour and potential occupational interventions and provide an economical tool for research and training purposes.

Therefore, the aims of the present study are:

A To test the psychometric properties of TL, its dimension, and the core TL in a German population (structural validity and internal consistency).

B To test the associations of core TL with depressive symptoms (criterion validity).

2 MATERIAL AND METHODS

2.1 Study population

A random sample of 4,027 employees, aged 20 years and above and representing the average distribution of age and gender, was drawn from the overall workforce of a middle-sized German company (n = 7,235). A total of 1,632 employees (response rate 41,53%) completed an online survey and provided written informed consent. Due to the exclusion of missing values, the sample for the analysis comprised 1,446 participants.

2.2 Questionnaires

2.2.1 Transformational leadership inventory (TLI)

TL was assessed, using the validated German version of the "Transformational leadership inventory" (TLI; Cronbach's α = 0.90) (Podsakoff *et al.*, 1990; Podsakoff, MacKenzie and Bommer, 1996; Heinitz and Rowold, 2007), assessing ISN (three items), IS (four items), PAM (three items), FAG (four items) and AV (five items). The scale HPE was excluded a priori for practical and theoretical reasons. HPE has been shown to have low internal consistency (Cronbach's α = 0.61 and α = 0.62) (1990; Podsakoff, MacKenzie and Bommer, 1996) and low correlation with the other facets of TL in the validation studies. It is also not one of the TL's proposed core dimensions (Podsakoff *et al.*, 1990; Heinitz and Rowold, 2007). Each item was rated on a five-point Likert scale ranging from 1 (not at all) to 5 (all of the time). The mean is calculated for the sub-scores of the respective TLI factors (Heinitz and Rowold, 2007).

2.2.2 Hospital anxiety and depression scale (HADS)

Depressive symptoms were assessed using the validated German version of the Hospital Anxiety and Depression Scale (HADS; Cronbach's α = 0.88) (Zigmond and Snaith, 1983; Hinz and Schwarz, 2002). The depression subscale (HADS-D) with seven items coded on a four-point Likert scale was employed. The HADS is an established instrument to predict symptom severity (Bjelland *et al.*, 2002) and psychosocial and physical outcomes (Herrmann, 1997). It has been shown to be valid in the general population with a high concurrent validity with other well-established tests such as the Beck Depression Inventory (BDI), State-Trait Anxiety Inventory (STAI), Clinical Anxiety Scale (CAS) and Symptom Checklist-90 (SCL-90) (Bjelland *et al.*, 2002). A sum score was computed (ranging from 0 to 21) with higher values indicating more depressive symptoms. For logistic regressions, the cut-off for the presence of depressive symptoms was set at > 8, as proposed in the literature (Bjelland *et al.*, 2002).

2.3 Data analysis

The analytic strategy comprised three steps. First, structural validity of the TLI score was assessed with confirmatory factor analysis (CFA). The TLI score was entered as a latent variable, defined by the respective subscores, which were entered on manifest item-basis. Three models were tested:

1. A one-factor model in which all items load on the TLI score as the latent variable, omitting the subscores (see Figure 4).
2. The full model in which all items load on the subscores (AV, FAG, PAM, IS, ISN) which then define the TLI score as the latent variable (see Figure 5).
3. The core TL model, which only includes the subscores AV, FAG and PAM loading on the TLI score. (see Figure 6)

Second, item analysis of the core TL dimensions was carried out, using calculated mean values and standard deviations (SD). Additionally, internal consistency was assessed via Cronbach's α, item-total correlation and the α if the item was deleted.
Third, criterion validity was assessed in two ways. First, structural equation modelling (SEM) with HADS-D as the outcome variable was used to compare both the full and the core TL model in relation to depressive symptoms. Additionally, both models were stratified for gender (Stewart, 2003). SEM analyses were carried out employing bootstrapping (n=5000), to accord for non-normal distribution (Sainani, 2012), and maximum likelihood estimation. In accordance with current literature following fit indices to compare model fit between the three models were reported: Chi-Square (X^2), Tucker-Lewis-Index (TLIx), Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA) (Hu and Bentler, 1999; Hooper, Coughlan and Mullen, 2008).

Second, logistic regression models were carried out to quantify the association between TL and depressive symptoms for the full and the core TL model and the respective subscores. Analyses were adjusted for a priori identified relevant confounders: age, alcohol consumption, BMI, marital status, smoking, education, gender, physical activity and job position. The core TL was split into tertiles, using high TL as the reference group. Here, too, analyses were additionally stratified for gender to account for between-group-differences (Yusuf *et al.*, 2004; Herr *et al.*, 2014). All analyses were carried out using SPSS and AMOS Version 24.0, Inc., Chicago, IL. The study was approved by the ethics committee of the University of Heidelberg, medical faculty Mannheim (2012-367N-MA).

3 RESULTS

3.1 Participant characteristics

About half of the participants were male (51.6%) with an average age of 41 years (SD 9.41 years) (Table 5). The majority of the participants were married (60.2%), had received higher education (59.4%) and worked in white collar jobs (68.6%).

Table 5: Participant characteristics

	N	*% / M (SD)*
Age		41.35 (9.41)
Sex		
Male	837	51.6
Female	785	48.4
Alcohol consumption		
None	214	14,3
Irregular	1115	74,5
Daily	167	11,2
Marital status		
Married	972	60.2
Single, widowed, divorced	643	39.8
Smoking habits		
Active smoker	232	15.5
No or ex-smoker	1263	84.5
Physical activity		
More than 2h / week	443	29.7
Less than 2 hours/week	1050	70.3
Body mass index (kg/m^2)		25.40 (4.32)
Education		
Higher education	956	59.4
Lower education	653	40.6
Job position		
White collar	1110	68,6
Blue collar	509	31.4

%: percentage, M: mean, SD: standard deviation

3.2 Structural validity

Due to the exclusion of missing values, the sample in the CFA consisted of 1,251 participants. An overview of the model fit-indices for the three models is shown in Table 6. The model fit for the one-factor model was not acceptable (χ^2 =19025.052, df = 912, p < .001). The model fit for both the full model (χ^2 =2636.19, df = 852, p < .001) and the core TL model (χ^2 =1313.38, df = 306, p < .001) was acceptable. Standardised regression coefficients for both the full model (Figure 5) and the core TL model (Figure 6) showed the highest associations between the factors AV, FAG and PAM (FAG – PAM (.88), AV-PAM (.83) and AV-FAG (.87)).

Table 6: Confirmatory factor analysis (CFA) - Model fit indices

	χ²	***df***	***CFI***	***TLIx***	***RMSEA***
ONE-FACTOR MODEL (FIGURE 4)	19025.052***	912	0.82	0.79	0.05 (0.05-0.05)
FULL MODEL (FIGURE 5)	2636.19***	852	0.96	0.96	0.02 (0.02-0.03)
CORE TL MODEL (FIGURE 6)	1313.38***	306	0.97	0.96	0.03 (0.03-0.03)

X²: Chi-Square, df: degrees of freedom, TLIx: Tucker-Lewis-Index, CFI: Comparative fit index, RMSEA: and Root mean square error of approximation, p: probability value; ***: *p* <.001

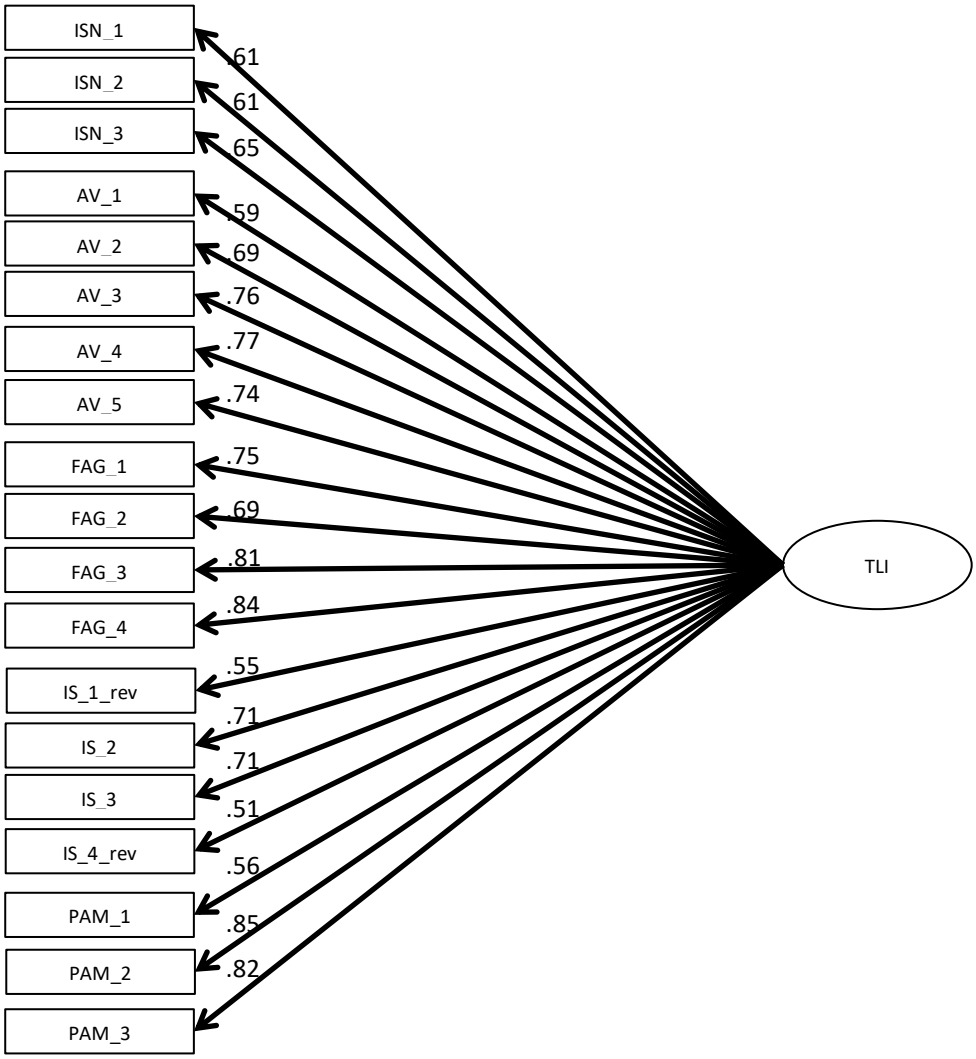

Figure 4: Confirmatory factor analysis (CFA): One-factor model
N = 1,251. Values on arrows display standardised regression coefficients (βs), ISN: intellectual stimulation, AV: identifying and articulating a vision, PAM: providing an appropriate model, FAG: fostering the acceptance of group goals, IS: providing individualised support. The respective items are displayed on the left. Error terms are not displayed.

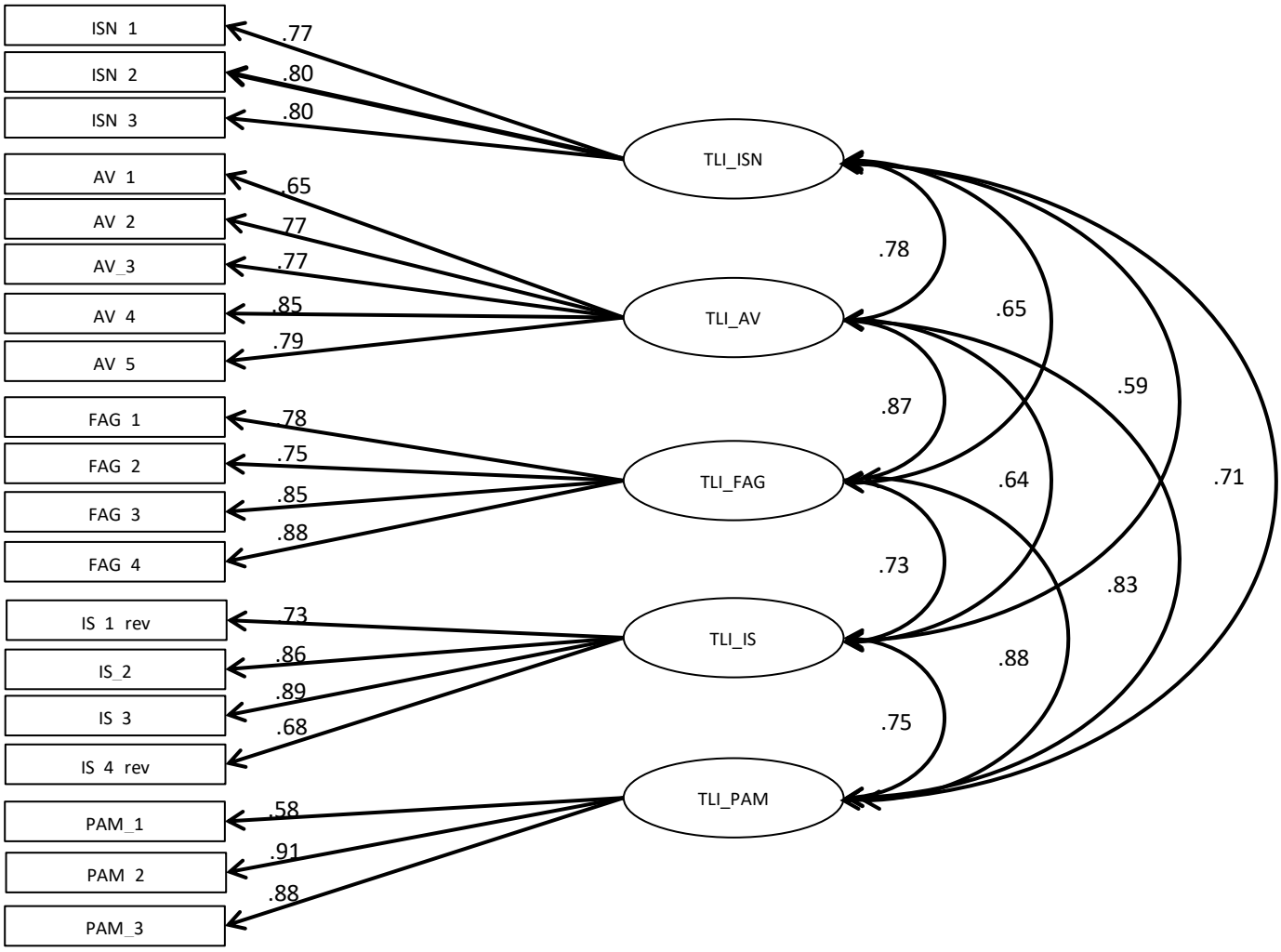

Figure 5: Confirmatory factor analysis (CFA): Full model
N = 1,251. Values on arrows display standardised regression coefficients (βs), ISN: intellectual stimulation, AV: identifying and articulating a vision, PAM: providing an appropriate model, FAG: fostering the acceptance of group goals, IS: providing individualised support. The respective items are displayed on the left. Error terms are not displayed.

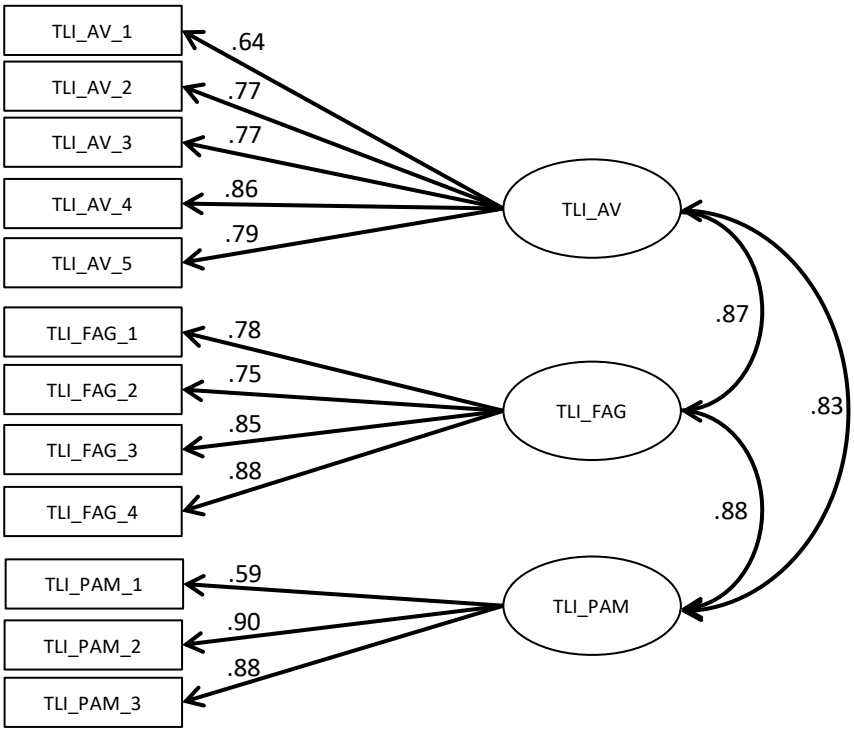

Figure 6: Confirmatory factor analysis (CFA): Core TL model
N = 1,251. Values on arrows display standardised regression coefficients (βs), AV: identifying and articulating a vision, PAM: providing an appropriate model, FAG: fostering the acceptance of group goals, the respective items are displayed on the left. Error terms are not displayed.

3.3 Item analysis

The core TL showed good internal consistency (Table 7). Cronbach's α was 0.94 with an item-total correlation ranging from 0.55 to 0.81. Cronbach's α of the core TL did not improve after deletion of any item (see Table 7). Regarding the sub-dimensions, for AV the Cronbach's α was 0.88 and the item-total correlation of at least 0.62. Cronbach's α for FAG was of 0.89, and the item-total correlation was 0.72 or higher. For PAM Cronbach's α was 0.83, with an item-total correlation varying from 0.55 to 0.77. Cronbach's α of the core TL did not improve after deletion of any item.

Table 7: Item analysis

Scale item	Mean (SD)	Internal consistency							
		Core TL		AV		FAG		PAM	
		Item-total correlation	α if item deleted	Item-total correlation	α if item deleted	Item-total correlation	α if item deleted	Item-total correlation	α if item deleted
… ist ständig auf der Suche nach neuen Möglichkeiten für die Abteilung.	3.26 (0.97)	0.58	0.94	0.62	0.87				
… zeichnet ein interessantes Bild der Zukunft unserer Arbeitsgruppe.	2.90 (1.06)	0.69	0.93	0.73	0.84				
… hat ein klares Verständnis dafür, wo sich unsere Arbeitsgruppe hinbewegt.	3.52 (1.00)	0.75	0.93	0.68	0.86				
… inspiriert durch ihre Pläne für die Zukunft.	3.01 (1.01)	0.78	0.93	0.80	0.83				
… schafft es, andere an ihre Zukunftsträume zu binden.	2.76 (0.99)	0.73	0.93	0.71	0.85				
… pflegt die Zusammenarbeit unter Arbeitsgruppen.	3.50 (0.99)	0.73	0.93			0.71	0.87		
… ermutigt ihre Mitarbeiter dazu, "team player" zu sein (d. h. gruppenorientiert zu arbeiten).	3.68 (1.00)	0.67	0.94			0.72	0.86		
… bringt die Gruppe dazu, gemeinsam für ein Ziel zu arbeiten.	3.48 (0.97)	0.79	0.93			0.78	0.84		
…. entwickelt ein Wir-Gefühl und Teamgeist bei den Mitarbeitern ihrer Abteilung.	3.31 (1.08)	0.81	0.93			0.79	0.84		
… führt eher durch "Taten" denn durch "Anweisungen".	3.09 (0.95)	0.55	0.93					0.55	0.89
…. ist ein gutes Vorbild, dem man leicht folgen kann.	3.27 (1.07)	0.80	0.94					0.77	0.69
… führt durch beispielhaftes Verhalten.	3.42 (1.04)	0.78	0.93					0.77	0.68
Cronbachs α			0.94		0.88		0.89		0.83

SD: standard deviation, AV: identifying and articulating a vision, PAM: providing an appropriate model, FAG: fostering the acceptance of group goals.

3.4 Criterion validity

The comparison of the relation between TL and depressive symptoms for the full model and the core TL model was performed with two statistical techniques: SEM and logistic regression analyses.

In the SEM analyses, the relationship between TL and depressive symptoms was similar for both models ($\beta_{full\ model}$ = -.35; $\beta_{core\ TL}$ = -.34) (see Figure 7). The lowest regression weights were found for ISN and IS with *β* of .76 and .77. Both the full model and the core TL model showed acceptable data fit (Table 8). The core TL model fit the data better than the full model ($\Delta\chi^2$ = 4112.87, *df* = 618, *p* < .001).

Table 8: Structure equation models – Model fit indices

	χ²	***df***	***CFI***	***TLIx***	***RMSEA***
FULL MODEL (FIGURE 7)	5510.94***	990	0.95	0.95	0.03 (0.02-0.03)
CORE TL MODEL (FIGURE 7)	1398.07***	372	0.97	0.96	0.03 (0.03-0.03)

X²: Chi-Square, df: degrees of freedom, TLIx: Tucker-Lewis-Index, CFI: Comparative Fit Index, RMSEA: and Root Mean Square Error of Approximation, p: probability value; ***: p <.001.

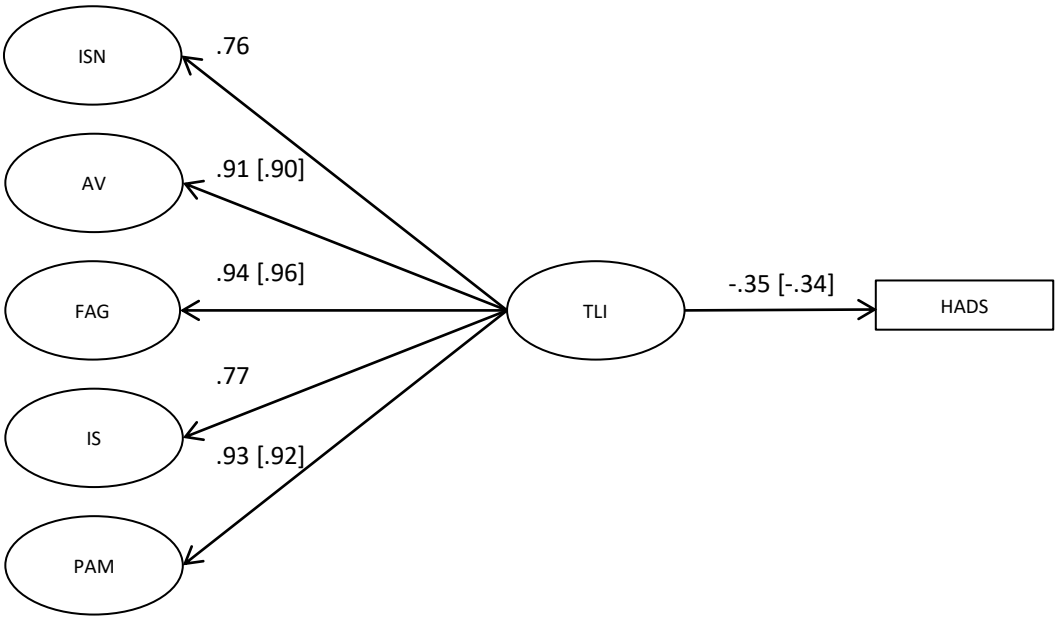

Figure 7: SEM: Full - and core TL model
N = 1,251. Values on arrows display standardised regression coefficients (βs), values in braces are those for the core TL model. ISN: intellectual stimulation, AV: identifying and articulating a vision, PAM: providing an appropriate model, FAG: fostering the acceptance of group goals, IS: providing individualised support. Error terms and manifest items are not displayed.

Table 9 shows the *β* values for the models stratified for gender, indicating that the association between TL and depressive symptoms is stronger among male worker (*ß* = -0.41) [*ß* = -0.40] in the full and the core TL model.

Table 9: Standardised regression coefficients (β) of the two different models tested, each stratified for gender, on depressive symptoms (HADS: cut-off > 8)

	All	**Men**	**Women**
FULL MODEL	-0.35	-0.41	-0.26
CORE TL MODEL	-0.34	-0.40	-0.26

Table 10 shows the results for the logistic regression models. For the full and the core TL model, individuals within the lowest TL tertile were 4 to 4.5 times more likely to experience depressive symptoms than those in the highest tertile (OR = 3.98, 95% C.I. 2.87-5.52; $p < 0.01$ and OR = 4.50, 95% C.I. 3.23 – 6,27; $p < 0.01$). This association remained consistent for all subscores. The association in the core TL model was strongest for men, both in the core TL and the full model (men: OR = 4.46 95% C.I. 2.86 – 6.95; $p <0.01$ and OR = 5.10, 95% C.I. 3.20-8.14; $p<0.01$; women: OR = 3.61 95% C.I. 2.20 – 5.93; $p <0.01$ and OR = 3.94, 95% C.I. 2.43-6.39; $p<0.01$).

Table 10: Logistic regression models with TL, split into tertiles (Lack of TL: lowest tertile), as independent variable and HADS (cut-off > 8) as dependent variable.

	Core TL model		**Full model**		**Subscores**		
	HADS (Cut-off 8)						
	OR	*95% C.I.*	*OR*	*95% C.I.*		*OR*	*95% C.I.*
All (n = 1446)					**AV Score**		
Lack of TL	3.98	(2.87-5.52)	4.50	(3.23-6.27)	Lack of TL	3.36	(2.46-4.59)
Intermediate TL	2.41	(1.72-3.36)	2.37	(1.7-3.35)	Intermediate TL	1.69	(1.19-2.40)
Good TL	1		1		Good TL	1	
Men (n=756)					**FAG score**		
Lack of TL	4.46	(2.86-6.95)	5.10	(3.20-8.14)	Lack of TL	3.56	(2.49-5.08)
Intermediate TL	2.40	(1.50-3.83)	2.35	(1.44-3.84)	Intermediate TL	1.68	(1.15-2.44)
Good TL	1		1		Good TL	1	
Women (n = 690)					**PAM score**		
Lack of TL	3.61	(2.20-5.93)	3.94	(2.43-6.39)	Lack of TL	3.33	(2.40-4.62)
Intermediate TL	2.56	(1.57-4.15)	2.51	(1.53-4.13)	Intermediate TL	1.84	(1.28-2.65)
Good TL	1		1		Good TL	1	

Models are adjusted for age, alcohol consumption, BMI, marital status, smoking, education, gender, physical activity and job position.
TL: transformational leadership, AV: identifying and articulating a vision, PAM: providing an appropriate model, FAG: fostering the acceptance of group goals.

4 DISCUSSION

4.1 Overview

The present study is, to the best of the knowledge of the author, the first to examine the relationship between TL and depressive symptoms while taking into consideration the different components of TL. The fit of the CFA for the full model was acceptable and best for the core TL model. In the full model the subscores AV, FAG and PAM displayed the highest loadings on the TL and reducing the model to the core TL in SEM did not significantly alter the Betas. Item analyses indicated good internal consistency of the core TL. The SEM-analyses revealed a significant association between lower levels of the core TL and more depressive symptoms. Logistic regression analyses based on TL split in tertiles further suggested a dose-response relationship of both the full and the core TL model, indicating a positive linear relation. In summary, three of the five TL dimensions explain most of the variance in the relation between TL and depressive symptoms. Thus, it is feasible to use the shortened TLI, which consists of 12 items, as opposed to 19 items in the full version, as a tool for research and training purposes in the context of TL and depressive symptoms in employees**.**

4.2 Relation to previous research

More than 25 years ago, Podsakoff et al. (1990) suggested certain facets of TL (AV, FAG, PAM) to be indicators of an underlying “core TL”. The German validation study supported these findings, as those facets again showed the highest correlations with the measure for TL. In a recent meta-analysis, Harms et al. (2017) further hypothesized that the more abstract aspects of TL as ISN and HPE are less important for the effect of TL on measures of mental health than the other, more "relationship-based components".

Leadership behaviour promoting a clear and inspiring vision of the future (AV) can induce positive appraisal and reduce maladaptive behaviour in subordinates (Lyons and Schneider, 2009) as demands are rather perceived as a challenge instead of a menace (Wegge, Shemla and Haslam, 2014). It could also lead to a more meaningful work-environment, another contextual resource (Nielsen *et al.*, 2008; Perko, Kinnunen and Feldt, 2014). The global perception that events are meaningful, understandable and manageable, is called Sense Of Coherence (SOC), which correlates strongly and negatively with depressive symptoms (Eriksson, 2006) and is therefore an essential mechanism that allows people to reflect and mobilise their internal and external resources of resistance, thus fostering active coping (Hartung, 2011).

The effects of shared visions and sense of community promoted by leaders who unite their followers probably even stretch further. Those personal qualities comprise encouraging cooperation, working towards common goals (FAG) and setting an example which is consistent with one's own values (PAM). This behaviour can result in a social support culture within a group (Lyons and Schneider, 2009), which is another crucial protective contextual resource for employees (Stansfeld *et al.*, 1997; Arnold *et al.*, 2007; Nielsen and Daniels, 2012; Zwingmann *et al.*, 2014).

Intellectual stimulation (ISN), on the other hand, which requires re-examining assumptions on and re-thinking procedures about one's work can induce stress and result in uncertainty, especially when it requires the employee to back opinions with reason (Seltzer, Numerof and Bass, 1989). For some employees, "thinking out of the box" might be beneficial, but it also has been linked with burnout and negative well-being (Seltzer, Numerof and Bass, 1989; Zineldin and Hytter, 2012). In the present study, though, ISN did not contribute significantly to the relation between TL and depressive symptoms.

Even though it seems plausible that the individualised consideration (IS) of an employee's personal needs and feelings should have a positive impact on stress and eventually depressive symptoms, in the present study, this facet played a less important role. Previous research proposed that IS (and AV and PAM) fosters perceptions of trust and confidence and provides appreciation and empathy (Franke and Felfe, 2011). A possible reason for the different findings in the present study could be that high levels of individual exchange between leaders and employees can lead to the employee feeling obliged to help their supervisors in any way possible to return the favours that they received, therefore again inducing stress and depressive symptoms (Harris and Kacmar, 2006). This could outweigh the positive effects of IS on depressive symptoms.

Overall, the association of TL and depressive symptoms is most likely through an indirect influence on resources like meaningful work-environment, support culture and SOC. These findings support the explanatory value of the JD-R and the COR theory in this context. Regarding Wegge's model of how leadership influences employee's health (Wegge, Shemla and Haslam, 2014), especially the leader's system focused action (Pathway 2), moderating influence on contextual factors (Pathway 3) and climate control (Pathway 4) seem to show the most significant impact. On the basis of this model, the impact leaders have on depressive symptoms in employees extends the personal contact between the leader and an individual employee to the full measure of contextual factors that leaders can influence.

Another interesting finding is the higher association of TL and depressive symptoms for men. Significantly, male employees reporting low TL have a more than 4 times higher risk than females of reporting depressive symptoms. There are no prior reports on this gender difference as in both previous studies, women were highly overrepresented with 85% and 93%, respectively (Munir, Nielsen and Gomes

Carneiro, 2010; Perko, Kinnunen and Feldt, 2014). However, in the present study gender is almost equally distributed (48.4% female). In general, most studies and meta-analyses on TL and mental health either do not report differences for men and women or show skewed gender distribution. Further studies are needed to explore the influence of gender on the relation of TL and depressive symptoms.

4.3 Strengths and Limitations

The present study supports previous findings on the inverse correlation of TL and depressive symptoms. Beyond that, it is the first study to examine the effects of the different dimensions of TL on depressive symptoms. On this basis, we validated a shortened, yet three-dimensional, version of the TLI which could represent a useful tool for research and training purposes. On the one hand, a shorter tool can lead to an improved response rate which is important for screening purposes (Rolstad, Adler and Rydén, 2011). On the other hand, the findings of our study can help specify leadership interventions which aim at reducing depressive symptoms in the workforce.

In addition, the gender difference in the association of TL and depressive symptoms is a novel finding which should be further explored.

Nevertheless, several limitations of this study need to be addressed. First, the cross-sectional design of this study does not allow any conclusions about potential causal relationships between TL and depressive symptoms. Moreover, common in workplace studies is a healthy worker bias (selection of healthy workers) which may influence the association between TL and depressive symptoms as employees who experience the worst leadership might be more likely to quit their job or be absent because of depression. This, in turn, would lead to underestimation of the association. HPE were not measured in this study. Even though the dimension HPE has been shown to have low internal consistency in two separate populations and low correlation with other TL

scales (Heinitz and Rowold, 2007) results could be different for the studied population, and influence of this factor on depressive symptoms cannot be ruled out. Although the dimensions IS and ISN did not show significant influence on the relation with TL and burnout in our study, further studies are needed to prove the generalisability of our findings. It could be of interest if those two aspects of TL are of greater importance for certain subgroups.

5 CONCLUSION

Working conditions have changed over the last decades resulting in reduced traditional workplace hazards, whereas conditions as work-stress, mental strain and depression have become more critical. Depressive disorders, which are multifaceted (Prisciandaro and Roberts, 2005) and not always clearly recognisable (Perko, Kinnunen and Feldt, 2014) are common in the general population (Jacobi et al., 2004). An important modifiable risk factor for employee's psychosocial well-being in the workforce context is leadership (Kuoppala et al., 2008). Especially high levels of TL have been associated with reduced depressive symptoms (Munir, Nielsen and Gomes Carneiro, 2010; Perko, Kinnunen and Feldt, 2014). There is evidence that certain TL dimensions (PAM, FAG and AV) could represent core TL behaviour with respect to mental health (Podsakoff et al., 1990; Heinitz and Rowold, 2007). Thus, this study employs the multidimensional TLI to assess TLI. Increasing resources or decreasing job demands could mediate the association in the sense of the job demands-resources theory (JD-R); (Arnold et al., 2007).

This study aimed to a) test the psychometric properties of TL, its dimension, and the core TL in a German population, and b) to test the associations of core TL with depressive symptoms.

The study was performed on the overall workforce of a middle-sized German company. Leadership was assessed with the German version of the TLI; (Podsakoff et al., 1990; Podsakoff, MacKenzie and Bommer, 1996; Heinitz and Rowold, 2007), assessing five dimensions of TL: AV (five items), FAG (four items), PAM (three items), IS (four items) and ISN (three items). Depressive symptoms were assessed using the Hospital Anxiety and Depression Scale (HADS); (Zigmond and Snaith, 1983; Hinz and Schwarz, 2002).

Analyses revealed a relationship between lower levels of TL, and higher ratings of depressive symptoms, with a stronger effect for male employees. The core TL model proved to be a valid and useful instrument to measure TL.

The results support the theory that the three dimensions of TL: AV, FAG and PAM represent an underlying core TL that explains most of the association of TL and depressive symptoms in the present study. Leadership which provides an authentic model for employees to follow promotes cooperation among employees towards a particular goal and is inspiring is associated with reduced risk of depressive symptoms in employees. It is feasible to use the shortened TLI which consists of 12 items as opposed to 19 items in the full version as an economic tool for research and training purposes in the context of TL and depressive symptoms in employees.

Prospective studies in different work-environments and populations are needed to further explore the potential directions of causality and generalizability of the assumptions. In addition, gender differences in the relationship between TL and depressive symptoms should be explored.

6 REFERENCES

Adler, D. A., McLaughlin, T. J., Rogers, W. H., Chang, H., Lapitsky, L. and Lerner, D. (2006) 'Job performance deficits due to depression', *American Journal of Psychiatry*, 163(9), pp. 1569–1576. doi: 10.1176/ajp.2006.163.9.1569.

Arnold, K. A. (2017) 'Transformational leadership and employee psychological well-being: A review and directions for future research.', *Journal of Occupational Health Psychology*, 22(3), pp. 381–393. doi: 10.1037/ocp0000062.

Arnold, K. a, Turner, N., Barling, J., Kelloway, E. K. and McKee, M. C. (2007) 'Transformational leadership and psychological well-being: the mediating role of meaningful work.', *Journal of occupational health psychology*, 12(3), pp. 193–203. doi: 10.1037/1076-8998.12.3.193.

Bakker, A. B. and Demerouti, E. (2007) 'The Job Demands-Resources model: state of the art', *Journal of Managerial Psychology*, 22(3), pp. 309–328. doi: 10.1108/02683940710733115.

Bass, B. M. (1985) 'Leadership: Good, better, best', *Organizational Dynamics*, 13(3), pp. 26–40. doi: 10.1016/0090-2616(85)90028-2.

Bass, B. M. (1999) 'Two Decades of Research and Development in Transformational Leadership', *European Journal of Work and Organizational Psychology*, 8(June 2012), pp. 9–32. doi: 10.1080/135943299398410.

Bass, B. M. and Riggio, R. E. (2006) *Transformational leadership*. Mahwah, N.J.: Erlbaum.

Bass BM and Avolio BJ (1991) *The full range of leadership development: Basic and advanced manuals*. Binghampton NY: Bass, Avolio, and Associates.

Beardslee, W. R. and Gladstone, T. R. (2001) 'Prevention of childhood depression: recent findings and future prospects.', *Biological psychiatry*, 49(12), pp. 1101–1110. doi: 10.1016/S0006-3223(01)01126-X.

Bjelland, I., Dahl, A. A., Haug, T. T. and Neckelmann, D. (2002) 'The validity of the Hospital Anxiety and Depression Scale. An updated literature review', *Journal of Psychosomatic Research \n*, 52(2), pp. 69–77. doi: 10.1016/S0022-3999(01)00296-3.

Briley, M. and Lépine (2011) 'The increasing burden of depression', *Neuropsychiatric Disease and Treatment*, 7(SUPPL 1), p. 3. doi: 10.2147/NDT.S19617.

British-Psychological-Society (2010) *The NICE Guideline on the Treatment and Management of Depression in adults*. Leicester (UK). Available at: http://www.ncbi.nlm.nih.gov/books/NBK55364/.

Bruce, M. L. and Hoff, R. A. (1994) 'Social and physical health risk factors for first-onset major depressive disorder in a community sample', *Social Psychiatry and Psychiatric Epidemiology*, 29(4), pp. 165–171. doi: 10.1007/BF00802013.

Burns, J. M. (1978) *Leadership*. New York: Harper & Row.

Cohen, S., Janicki-Deverts, D. and Miller, G. E. (2007) 'Psychological stress and disease.', *journal of the American Medical Association*, 298(14), pp. 1685–1687. doi: 10.1001/jama.298.14.1685.

Conger, J. A. and Kanungo, R. N. (1998) *Charismatic leadership in organizations.* Thousand Oaks, CA: Sage. doi: http://dx.doi.org/10.4135/9781452204932.

Corrigan, P. W., Diwan, S., Campion, J. and Rashid, F. (2003) 'Transformational leadership and the mental health team', *Administration and Policy in Mental Health*, 30(2), pp. 97–108.

Dionne, S. D., Yammarino, F. J., Atwater, L. E. and Spangler, W. D. (2004) 'Transformational leadership and team performance', *Journal of Organizational Change Management*, 17, pp. 177–193. doi: 10.1108/09534810410530601.

Eriksson, M. (2006) 'Antonovsky's sense of coherence scale and the relation with health: a systematic review', *Journal of Epidemiology & Community Health*, 60(5), pp. 376–381. doi: 10.1136/jech.2005.041616.

Felfe, J. (2006) 'Transformationale und charismatische Führung - Stand der Forschung und aktuelle Entwicklungen', *Zeitschrift für Personalpsychologie*, 5(4), pp. 163–176. doi: 10.1026/1617-6391.5.4.163.

Ferrari, A. J., Charlson, F. J., Norman, R. E., Patten, S. B., Freedman, G., Murray, C. J. L., Vos, T. and Whiteford, H. A. (2013) 'Burden of Depressive Disorders by Country, Sex, Age, and Year: Findings from the Global Burden of Disease Study 2010', *PLoS Medicine*, 10(11). doi: 10.1371/journal.pmed.1001547.

Finne, L. B., Christensen, J. O. and Knardahl, S. (2014) 'Psychological and social work factors as predictors of mental distress: A prospective study', *PLoS ONE*, 9(7). doi: 10.1371/journal.pone.0102514.

Flint, J. and Kendler, K. S. (2014) 'The Genetics of Major Depression', *Neuron*. Elsevier, 81(3), pp. 484–503. doi: 10.1016/j.neuron.2014.01.027.

Franke, F. and Felfe, J. (2011) 'How does transformational leadership impact employees' psychological strain?: Examining differentiated effects and the moderating role of affective organizational commitment', *Leadership*, 7(3), pp. 295–316. doi: 10.1177/1742715011407387.

Gang Wang, Oh, I.-S., Courtright, S. H. and Colbert, a. E. (2011) 'Transformational Leadership and Performance Across Criteria and Levels: A Meta-Analytic Review of 25 Years of Research', *Group & Organization Management*, 36(2), pp. 223–270. doi: 10.1177/1059601111401017.

De Graaf, R., Tuithof, M., Van Dorsselaer, S. and Ten Have, M. (2012) 'Comparing the effects on work performance of mental and physical disorders', *Social Psychiatry and Psychiatric Epidemiology*, 47(11), pp. 1873–1883. doi: 10.1007/s00127-012-0496-7.

Harms, P. D., Credé, M., Tynan, M., Leon, M. and Jeung, W. (2017) 'Leadership and stress: A meta-analytic review', *Leadership Quarterly*. Elsevier Inc., 28(1), pp. 178–

194. doi: 10.1016/j.leaqua.2016.10.006.

Harris, K. J. and Kacmar, K. M. (2006) 'Too Much of a Good Thing: The Curvilinear Effect of Leader-Member Exchange on Stress', *The Journal of Social Psychology*, 146(1), pp. 65–84. doi: 10.3200/SOCP.146.1.65-84.

Hartung, S. (2011) 'Was hält uns gesund? Gesundheitsressourcen: Von der Salutogenese zum Sozialkapital', in *Die Gesellschaft und ihre Gesundheit*. Wiesbaden, Germany: VS Verlag für Sozialwissenschaften, pp. 235–255. doi: 10.1007/978-3-531-92790-9_12.

Heinitz, K. and Rowold, J. (2007) 'Gütekriterien einer deutschen Adaptation des Transformational Leadership Inventory (TLI) von Podsakoff', *Zeitschrift für Arbeits- und Organisationspsychologie A&O*, 51(1), pp. 1–15. doi: 10.1026/0932-4089.51.1.1.

Herr, R. M., Li, J., Bosch, J. a., Schmidt, B., DeJoy, D. M., Fischer, J. E. and Loerbroks, A. (2014) 'Psychometric properties of a German organizational justice questionnaire (G-OJQ) and its association with self-rated health: findings from the Mannheim Industrial Cohort Studies (MICS)', *International Archives of Occupational and Environmental Health*, 87(1), pp. 85–93. doi: 10.1007/s00420-012-0839-4.

Herrmann, C. (1997) 'International experiences with the Hospital Anxiety and Depression scale - A Review of validation data and clinical results', *Journal of Psychosomatic Research*, 42(1), pp. 17–41.

Hinz, A. and Schwarz, R. (2002) 'Testinformation', *Diagnostica*, 48(2), pp. 112–113. doi: 10.1026//0012-1924.48.2.112.

Hobfoll, S. E. (1989) 'Conservation of resources. A new attempt at conceptualizing stress.', *The American psychologist*, 44(3), pp. 513–24.

Hooper, D., Coughlan, J. and Mullen, M. (2008) 'Structural equation modeling: guidelines for determining model fit', *Electronic Journal of Business Research Methods*, 6(1), pp. 53–60.

House, R. J. and Howell, J. M. (1992) 'Personality and charismatic leadership', *The Leadership Quarterly*, 3(2), pp. 81–108. doi: 10.1016/1048-9843(92)90028-E.

Houtman, I., Jettinghoff, K. and Cedillo, L. (2007) *Raising awareness of stress at work in developing countries*. Geneva, Switzerland: WHO Press.

Howell, J. M. and Avolio, B. J. (1993) 'Transformational leadership, transactional leadership, locus of control, and support for innovation: Key predictors of consolidated-business-unit performance.', *Journal of Applied Psychology*, 78(6), pp. 891–902. doi: 10.1037/0021-9010.78.6.891.

Hu, L. and Bentler, P. M. (1999) 'Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives', *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), pp. 1–55. doi: 10.1080/10705519909540118.

Jacobi, F., Wittchen, H.-U., Hölting, C., Höfler, M., Pfister, H., Müller, N. and Lieb, R. (2004) 'Prevalence, co-morbidity and correlates of mental disorders in the general population: results from the German Health Interview and Examination Survey

(GHS)', *Psychological Medicine*, 34(4), pp. 597–611. doi: 10.1017/S0033291703001399.

Judge, T. A. and Piccolo, R. F. (2004) 'Transformational and transactional leadership: a meta-analytic test of their relative validity.', *The Journal of applied psychology*, 89(5), pp. 755–768. doi: 10.1037/0021-9010.89.5.755.

Kendler, K. S., Gardner, C. O. and Prescott, C. a (2002) 'Toward a comprehensive developmental model for major depression in women.', *The American journal of psychiatry*, 159(7), pp. 1133–1145. doi: 10.1176/appi.ajp.159.7.1133.

Kessler, R. C., Ph, D., Birnbaum, H., Shahly, V., Hwang, I., Mclaughlin, K. A., Sampson, N., Andrade, L. H., Girolamo, G. De, Demyttenaere, K., Haro, J. M. and Karam, A. N. (2010) 'Age differences in the prevelance and comorbidity of DSM-IV major depressive epoisodes: Results from the WHO World Mental Health Survey Initiative', *Depression and Anxiety*, 27(4), pp. 351–364. doi: 10.1002/da.20634.

Kirkbride, P. (2006) 'Developing transformational leaders: the full range leadership model in action', *Industrial and Commercial Training*, 38(1), pp. 23–32. doi: 10.1108/00197850610646016.

Kotov, R., Gamez, W., Schmidt, F. and Watson, D. (2010) 'Linking "big" personality traits to anxiety, depressive, and substance use disorders: A meta-analysis.', *Psychological Bulletin*, 136(5), pp. 768–821. doi: 10.1037/a0020327.

Kuehner, C. (2003) 'Gender differences in unipolar depression: an update of epidemiological findings and possible explanations', *Acta Psychiatrica Scandinavica*, 108(3), pp. 163–174. doi: 10.1034/j.1600-0447.2003.00204.x.

Kuoppala, J., Lamminpää, A., Liira, J. and Vainio, H. (2008) 'Leadership, job well-being, and health effects--a systematic review and a meta-analysis.', *Journal of occupational and environmental medicine / American College of Occupational and Environmental Medicine*, 50(8), pp. 904–15. doi: 10.1097/JOM.0b013e31817e918d.

Lerner, D. and Henke, R. M. (2008) 'What does research tell us about depression, job performance, and work productivity?', *Journal of Occupational and Environmental Medicine*, 50(4), pp. 401–410. doi: 10.1097/JOM.0b013e31816bae50.

Levinson, D. F. (2006) 'The Genetics of Depression: A Review', *Biological Psychiatry*, 60(2), pp. 84–92. doi: 10.1016/j.biopsych.2005.08.024.

Ling, Y., Simsek, Z., Lubatkin, M. H. and Veiga, J. F. (2008) 'The impact of transformational CEOs on the performance of small- to medium-sized firms: does organizational context matter?', *The Journal of applied psychology*, 93(4), pp. 923–934. doi: 10.1037/0021-9010.93.4.923.

Luppa, M., Heinrich, S., Angermeyer, M. C., König, H.-H. and Riedel-Heller, S. G. (2007) 'Cost-of-illness studies of depression', *Journal of Affective Disorders*, 98(1–2), pp. 29–43. doi: 10.1016/j.jad.2006.07.017.

Lyons, J. B. and Schneider, T. R. (2009) 'The effects of leadership style on stress outcomes', *Leadership Quarterly*. Elsevier B.V., 20(5), pp. 737–748. doi: 10.1016/j.leaqua.2009.06.010.

Masi, R. J. and Cooke, R. A. (2000) 'EFFECTS OF TRANSFORMATIONAL LEADERSHIP ON SUBORDINATE MOTIVATION, EMPOWERING NORMS, AND ORGANIZATIONAL PRODUCTIVITY', *The International Journal of Organizational Analysis*, 8(1), pp. 16–47. doi: 10.1108/eb028909.

Mausner-Dorsch, H. and Eaton, W. W. (2000) 'Psychosocial work environment and depression: Epidemiologic assessment of the demand-control model', *American Journal of Public Health*, 90(11), pp. 1765–1770. doi: 10.2105/AJPH.90.11.1765.

Montoya-weiss, M. M., Massey, A. P. and Song, M. (2001) 'Getting it together: Temporal coordination and conflict management in global virtual teams', *The Academy of Management Journal*, 44(6), pp. 1251–1262.

Munir, F., Nielsen, K. and Gomes Carneiro, I. (2010) 'Transformational leadership and depressive symptoms: A prospective study', *Journal of Affective Disorders*. Elsevier B.V., 120(1–3), pp. 235–239. doi: 10.1016/j.jad.2009.03.020.

Nerdinger, F. W. (2008) *Arbeits- und Organisationspsychologie*. Heidelberg: Springer Verlag (Springer-Lehrbuch). doi: 10.1007/978-3-540-74705-5.

Nerdinger, F. W., Blickle, G. and Schaper, N. (2014) *Arbeits- und Organisationspsychologie*. Heidelberg: Springer Verlag. doi: 10.1007/978-3-642-41130-4.

Netterstrøm, B., Conrad, N., Bech, P., Fink, P., Olsen, O., Rugulies, R. and Stansfeld, S. (2008) 'The relation between work-related psychosocial factors and the development of depression', *Epidemiologic Reviews*, 30(1), pp. 118–132. doi: 10.1093/epirev/mxn004.

Nielsen, K. and Daniels, K. (2012) 'Does shared and differentiated transformational leadership predict followers' working conditions and well-being?', *The Leadership Quarterly*. Elsevier Inc., 23(3), pp. 383–397. doi: 10.1016/j.leaqua.2011.09.001.

Nielsen, K., Randall, R., Yarker, J. and Brenner, S.-O. (2008) 'The effects of transformational leadership on followers' perceived work characteristics and psychological well-being: A longitudinal study', *Work & Stress*, 22(1), pp. 16–32. doi: 10.1080/02678370801979430.

Nielsen, K., Yarker, J., Randall, R. and Munir, F. (2009) 'The mediating effects of team and self-efficacy on the relationship between transformational leadership, and job satisfaction and psychological well-being in healthcare professionals: a cross-sectional questionnaire survey.', *International journal of nursing studies*, 46(9), pp. 1236–44. doi: 10.1016/j.ijnurstu.2009.03.001.

Özaralli, N. (2003) 'Effects of transformational leadership on empowerment and team effectiveness', *Leadership & Organization Development Journal*, 24(6), pp. 335–344. doi: 10.1108/01437730310494301.

Perko, K., Kinnunen, U. and Feldt, T. (2014) 'Transformational leadership and depressive symptoms among employees : mediating factors', *Leadership & Organizational Development Journal*, 35(4), pp. 286–304. doi: 10.1108/LODJ-07-2012-0082.

Petermann, F. (2011) 'Hospital Anxiety and Depression Scale, Deutsche Version

(HADS-D)', *Zeitschrift für Psychiatrie, Psychologie und Psychotherapie*, 59(3), pp. 251–253. doi: 10.1024/1661-4747/a000077.

Peters, A. and McEwen, B. S. (2012) 'Editorial introduction', *Physiology & Behavior*. Elsevier Inc., 106(1), pp. 1–4. doi: 10.1016/j.physbeh.2011.12.019.

Podsakoff, P. M., MacKenzie, S. B. and Bommer, W. H. (1996) 'Meta-analysis of the relationships between Kerr and Jermier's substitutes for leadership and employee job attitudes, role perceptions, and performance.', *The Journal of applied psychology*, 81(4), pp. 380–399. doi: 10.1037/0021-9010.81.4.380.

Podsakoff, P. M., MacKenzie, S. B., Moorman, R. H. and Fetter, R. (1990) 'Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors', *The Leadership Quarterly*, 1(2), pp. 107–142. doi: 10.1016/1048-9843(90)90009-7.

Prisciandaro, J. J. and Roberts, J. E. (2005) 'A taxometric investigation of unipolar depression in the national comorbidity survey.', *Journal of abnormal psychology*, 114(4), pp. 718–728. doi: 10.1037/0021-843X.114.4.718.

Riolo, S. A., Nguyen, T. A., Greden, J. F. and King, C. A. (2005) 'Prevalence of depression by race/ethnicity: Findings from the national health and nutrition examination survey III', *American Journal of Public Health*, 95(6), pp. 998–1000. doi: 10.2105/AJPH.2004.047225.

Roelen, C. a M., Weites, S. H., Koopmans, P. C., van der Klink, J. J. L. and Groothoff, J. W. (2008) 'Sickness absence and psychosocial work conditions: a multilevel study.', *Occupational medicine*, 58(6), pp. 425–30. doi: 10.1093/occmed/kqn073.

Rolstad, S., Adler, J. and Rydén, A. (2011) 'Response burden and questionnaire length: Is shorter better? A review and meta-analysis', *Value in Health*. Elsevier Inc., 14(8), pp. 1101–1108. doi: 10.1016/j.jval.2011.06.003.

Rosenbrock, R. (2001) 'Was ist New Public Health?', *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz*, 44(44), pp. 753–762. doi: 10.1007/s001030100231.

Rost, K., Smith, J. L. and Dickinson, M. (2004) 'The Effect of Improving Primary Care Depression Management on Employee Absenteeism and Productivity', *Medical Care*, 42(12), pp. 1202–1210. doi: 10.1097/00005650-200412000-00007.

Sainani, K. L. (2012) 'Dealing With Non-normal Data', *PM&R*. Elsevier Inc., 4(12), pp. 1001–1005. doi: 10.1016/j.pmrj.2012.10.013.

Schmidt, B., Loerbroks, A., Herr, R., Litaker, D., Wilson, M., Kastner, M. and Fischer, J. (2014) 'Psychosocial resources and the relationship between transformational leadership and employees' psychological strain', *Work*, 49(2), pp. 315–324. doi: 10.3233/WOR-131713.

Schott, T. and Kuntz, B. (2011) 'Sozialepidemiologie: Über die Wechselwirkungen von Gesundheit und Gesellschaft', in *Die Gesellschaft und ihre Gesundheit - 20 Jahre Public Health in Deutschland: Bilanz und Ausblick einer Wissenschaft*, pp. 159–171. doi: 10.1007/978-3-531-92790-9_8.

Seltzer, J., Numerof, R. E. and Bass, B. M. (1989) 'Transformational Leadership : Is It a Source of More Burnout and Stress ?', *Journal of Health and Human Resources Administration*, 12(2), pp. 174–185. doi: 10.2307/25780396.

Simon, G. E., Barber, C., Birnbaum, H. G., Frank, R. G., Greenberg, P. E., Rose, R. M., Wang, P. S. and Kessler, R. C. (2001) 'Depression and Work Productivity : The Comparative Costs of Treatment Versus Nontreatment', *Journal of Occupational and Environmental Medicine*, 43(1), pp. 2–9.

Skakon, J., Nielsen, K., Borg, V. and Guzman, J. (2010) 'Are leaders' well-being, behaviours and style associated with the affective well-being of their employees? A systematic review of three decades of research', *Work & Stress*, 24(2), pp. 107–139. doi: 10.1080/02678373.2010.495262.

Sparks, K., Faragher, B. and Cooper, C. L. (2001) 'Well-being and occupational health in the 21st century workplace', *Journal of Occupational and Organizational Psychology*, 74(4), pp. 489–509. doi: 10.1348/096317901167497.

Stansfeld, S. A., Fuhrer, R., Head, J., Ferrie, J. and Shipley, M. (1997) 'Work and psychiatric disorder in the Whitehall II Study', *Journal of Psychosomatic Research*, 43(1), pp. 73–81. doi: 10.1016/S0022-3999(97)00001-9.

Stewart, W. F. (2003) 'Cost of Lost Productive Work Time Among US Workers With Depression', *Journal of the American Medical Association*, 289(23), p. 3135. doi: 10.1001/jama.289.23.3135.

Walsh, M., Dupré, K. and Arnold, K. A. (2014) 'Processes through which transformational leaders affect employee psychological health', *Zeitschrift fur Personalforschung*, 28(1–2), pp. 162–172. doi: 10.1688/ZfP-2014-01-Walsh.

Wegge, J., Shemla, M. and Haslam, S. A. (2014) 'Leader behavior as a determinant of health at work: Specification and evidence of five key pathways', *Zeitschrift fur Personalforschung*, 28(1–2), pp. 6–23. doi: 10.1688/ZfP-2014-01-Wegge.

WHO (1986) *Health Promotion Action Means Build healthy public policy*, *WHO*. Available at: http://www.euro.who.int/__data/assets/pdf_file/0004/129532/Ottawa_Charter.pdf?ua=1 (Accessed: 12 February 2019).

WHO (1994) *Global strategy on occupational health for all: The way to health at work*. Available at: https://www.who.int/occupational_health/publications/globstrategy/en/ (Accessed: 12 February 2019).

WHO (2006) *Declaration on Workers Health*, *WHO Collaborating Centres of Occupational Health, Stresa, Italy*. Available at: https://www.who.int/occupational_health/Declarwh.pdf (Accessed: 12 February 2019).

WHO (2010) *Healthy Workplace Framework and Model*. Geneva, Switzerland: WHO Press.

Winslow, C. E. (1920) 'The untilled fields of public health', *Science (New York, N.Y.)*, 51, pp. 23–33. doi: 10.1126/science.51.1306.23.

Yusuf, P. S., Hawken, S., Ôunpuu, S., Dans, T., Avezum, A., Lanas, F., McQueen, M., Budaj, A., Pais, P., Varigos, J. and Lisheng, L. (2004) 'Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): Case-control study', *Lancet*, 364, pp. 937–952. doi: 10.1016/S0140-6736(04)17018-9.

Zigmond, a S. and Snaith, R. P. (1983) 'The Hospital Anxiety and Depression Scale', *Acta Psychiatrica Scandinavica*, 67(6), pp. 361–370. doi: 10.1111/j.1600-0447.1983.tb09716.x.

Zineldin, M. and Hytter, A. (2012) 'Leaders' negative emotions and leadership styles influencing subordinates' well-being', *The International Journal of Human Resource Management*, 23(4), pp. 748–758. doi: 10.1080/09585192.2011.606114.

Zwingmann, I., Wegge, J., Wolf, S., Rudolf, M., Schmidt, M. and Richter, P. (2014) 'Is transformational leadership healthy for employees? A multilevel analysis in 16 nations', *Zeitschrift fur Personalforschung*, 28(1–2), pp. 24–51. doi: 10.1688/ZfP-2014-01-Zwingmann.

7 APPENDIX

List of tables

List of figures

Questionnaires used in this study:

Transformational leadership Inventory (TLI) (Heinitz and Rowold, 2007)

TLI_ISN_1	hat mir neue Wege gezeigt, an Dinge heranzugehen, die für mich unverständlich waren.
TLI_ISN_2	hat Ideen, die mich dazu gebracht haben, einige meiner eigenen Gedanken zu überdenken, die ich vorher nicht infrage gestellt habe.
TLI_ISN_3	hat mich dazu angeregt, alte Probleme auf eine neue Art und Weise zu bedenken.
TLI_AV_1	ist ständig auf der Suche nach neuen Möglichkeiten für die Abteilung.
TLI_AV_2	zeichnet ein interessantes Bild der Zukunft unserer Arbeitsgruppe.
TLI_AV_3	hat ein klares Verständnis dafür, wo sich unsere Arbeitsgruppe hinbewegt.
TLI_AV_4	inspiriert durch ihre Pläne für die Zukunft.
TLI_AV_5	schafft es, andere an ihre Zukunftsträume zu binden.
TLI_FAG_1	pflegt die Zusammenarbeit unter Arbeitsgruppen.
TLI_FAG_2	ermutigt ihre Mitarbeiter dazu, "team player" zu sein (d. h. gruppenorientiert zu arbeiten).
TLI_FAG_3	bringt die Gruppe dazu, gemeinsam für ein Ziel zu arbeiten.
TLI_FAG_4	entwickelt ein Wir-Gefühl und Teamgeist bei den Mitarbeitern ihrer Abteilung.
TLI_PAM_1	führt eher durch "Taten" denn durch "Anweisungen".
TLI_PAM_2	ist ein gutes Vorbild, dem man leicht folgen kann.
TLI_PAM_3	führt durch beispielhaftes Verhalten.
TLI_IS_1	handelt, ohne meine Gefühle zu beachten.
TLI_IS_2	zeigt Respekt für meine persönlichen Gefühle.

TLI_IS_3	handelt auf eine Art und Weise, die meine persönlichen Gefühle berücksichtigt.
TLI_IS_4	behandelt mich auf eine Art und Weise, ohne auf meine persönlichen Gefühle Rücksicht zu nehmen.

HADS-D (Petermann, 2011)

HADS_D_D_1	Ich kann mich heute noch so freuen wie früher
HADS_D_D_2	Ich kann Lachen und die lustige Seite des Lebens sehen
HADS_D_D_3	Ich fühle mich glücklich
HADS_D_D_4	Ich fühle mich in meinen Aktivitäten gebremst
HADS_D_D_5	Ich habe das Interesse an meiner äusseren Erscheinung verloren
HADS_D_D_6	Ich blicke mit Freude in die Zukunft
HADS_D_D_7	Ich kann mich an einem guten Buch, einer Radio- oder Fernsehsendung freuen

9 CURRICULUM VITAE

PERSONAL DATA

Name:	Seegel, Max Leonhard
Date of birth:	20.04.1990
Place of birth:	Kassel
Marital status:	married
Father:	Dr. phil Falko Seegel
Mother:	Dr. med. Barabra Eistel-Seegel

EDUCATIONAL CAREER

1996 - 1999	Primary school (Lingg-Schule, Bad Hersfeld)
2000 - 2003	Gymnasium (Konrad-Duden-Schule, Bad Hersfeld)
2005 – 2008	Senior grades (Modellschule Obersberg, Bad Hersfeld)
31.05.2008	A-levels (Abitur, Modellschule Obersberg, Bad Hersfeld)

ACADEMIC CAREER

2009 - 2016	Medical studies (Ruprecht-Karls-University Heidelberg, Medical Faculty Mannheim)
05.09.2011	First medical exam (1. Abschnitt der Ärztlichen Prüfung)
09.10.2014	Second medical exam (2. Abschnitt der Ärztlichen Prüfung)
18.05.2016	Third medical exam (3. Abschnitt der Ärztlichen Prüfung)
17.06.2016	Approbation

10 ACKNOWLEDGEMENTS

First, I would like to thank Prof. Dr. med. Joachim E. Fischer for the possibility to work on this interesting topic with the support of the Mannheim Institute of Public Health.

My particular thanks go to Dr. Raphael Herr for his guidance, endurance and encouragement throughout the last years.

I would also like to thank Prof. Burkhard Schmidt and PD Adrian Loerbroks for their help in questions concerning study related questions.

Furthermore, I am very grateful to Nadine Gronewold, Irina Getzendörfer and Dr. Stu Mayrick for their support in research topics, statistical questions and linguistic issues.

Also, I would like to thank my parents, Dr. Barbara Eistel-Seegel and Dr. Falko Seegel, my wife Tabea Elstermann von Elster and Dr. Ilse-Lore Baschek for their patience, advice and motivation, which were necessary for the completion of this thesis.

Finally, I direct my thanks to Achim Eistel, my grandfather, who first published on leadership research in our family as early as 1996.